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ELECTRICAL WORLD

APRIL 23, 1932
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Weston will soon announce a well-developed and proven plan, built around the Weston Illumination Meter, that effectively helps to solve customer relation problems and sell increased lighting loads. Every public utility official should write for the complete story today.

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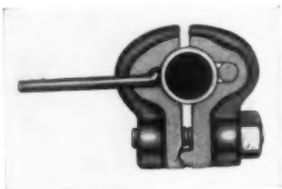
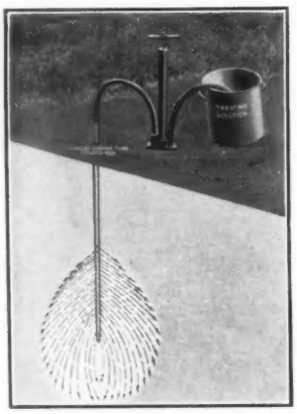
Illustrating ample contact of ground connection with rod and clamp.

MURRAY lever clamp provides for external ground as well as for electrode multiple connections.



View of multiple connections at clamp and rod showing generous cross-sections and contact surfaces.



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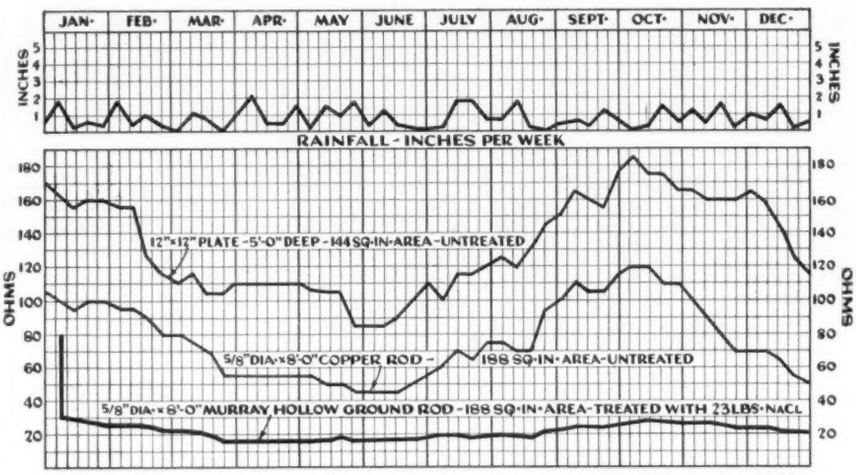
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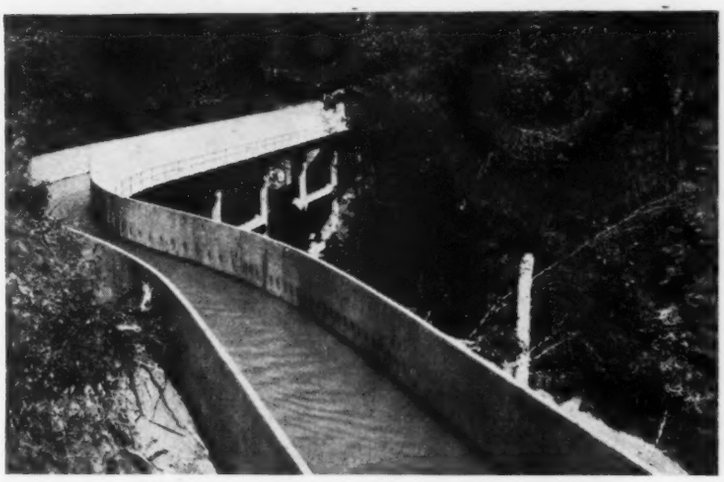

Flume construction
Mokelumne project
Pacific Gas & Elec. Co.

APRIL 23, 1932

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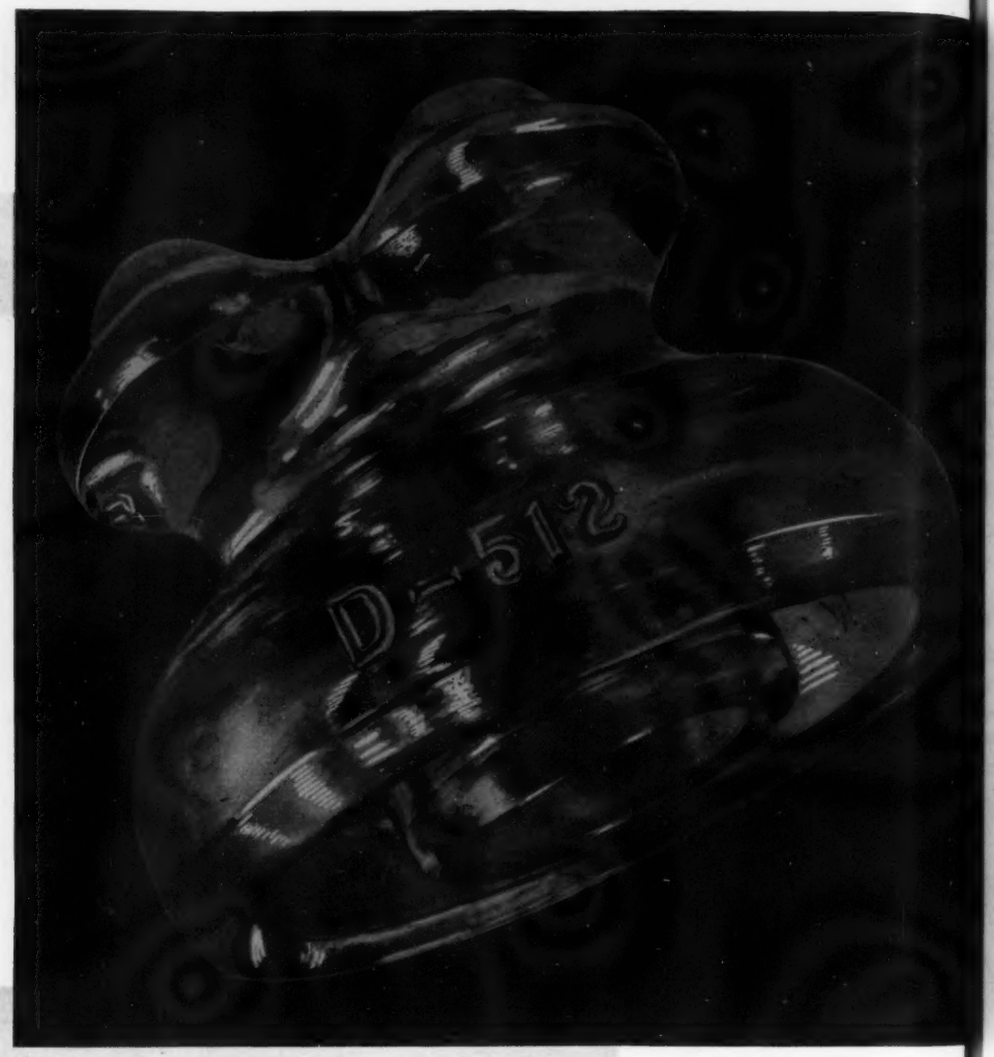

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ELECTRICAL WORLD

Established 1883. McGraw-Hill Publishing Company, Inc.

for the Week Ending

April 23, 1932

My greatest ambition in life is to hand down my name as clean as I received it. It's just that. It isn't a question of money or anything else. If any one has lost more than I have, I'd like to hear of it.

SAMUEL INSULL

[Mr. Insull is reported to have hurled a personal fortune of some $100,000,000 into the support of the failing companies which he founded in a vain effort to stave off disaster as security markets fell and credit tightened.]

Receivers appointed for several Insull properties

—**Insull investment companies** fail to pull through difficulties resulting from unprecedented drop in security market values and subsequent tightening of credit conditions. Middle West Utilities, Insull Utility Investments and Corporation Securities go down. Commonwealth Edison, People's Gas Light & Coke and Public Service Company of Northern Illinois are not affected. The story behind the crash—*pp. 719* and *728*.

California commission approves common-neutral plan

—**Common neutral is approved** for use in California after four years' trial. Economy of plan proved; safety factors increased; communication interference problems are not complicated. Advantages numerous—*p. 721*.

—**Refrigeration interests spar** for the 1932 market, and the purchasers will win no matter what happens. Prices have been lowered, and this week General Electric announces four years' free service—*p. 721*.

—**W. C. Baylies succeeds Edgar** as head of Edison Electric Illuminating Company of Boston. On the same day as Mr. Edgar, J. B. Miller, chairman Southern California Edison, also died—*p. 714*.

—**Welded fabrication approved** for shipbuilding by two most important British maritime boards. Possible revolution in construction practices foreseen as advantages develop—*p. 723*.

Roosevelt features utilities as Presidential campaign issue— *p. 714*

Governor Roosevelt for National Control of Interstate Utilities

As avowed candidate for President he assails expanded capitalization of holding companies as unwarranted and says rates are far too high.

"ELECTRICITY is a great unifying interest doing more to make us a united nation than any other material factor. To control it for the common good requires national thinking by a national party."

With this declaration Governor Franklin D. Roosevelt of New York concluded that portion of the first platform speech made by him in the avowed character of a candidate for the Democratic nomination for President which dealt with public utility matters. The speech was made at St. Paul on Monday evening, April 18, at a Jefferson dinner. After referring to the principle of regulation of public utilities to insure their adequacy and a reasonable price for service as centuries old, and briefly sketching the St. Lawrence River situation as he sees it, Governor Roosevelt said:

That is the obvious development of any sound government control over private utilities—that government itself should not engage in the utility business if it can find private initiative and private capital willing to undertake the business for a reasonable and fair return on the capital which it is necessary and wise to invest in the project, and, on the other hand, if government is not able to find private individuals or corporations willing to do this, then government must step in and do it itself.

If during this past generation that fundamental had been observed by our courts, by all of our public service commissions, by our legislatures, there would be no problem of the control of utilities today. It is an unfortunate fact, which is not denied by the leading bankers or the leading utility men themselves, that, largely through the building up of a series of great mergers and a series of great holding companies, the capital structure, especially in the case of the electric utilities, has been allowed to expand to an extent far beyond the actual wise and necessary cash investment.

It is a simple fact that in thousands of cases throughout the United States electric utility companies have sought to obtain and in many instances have succeeded in obtaining permission to charge rates which will bring an unnecessarily large return, not on the cash investment, but on a definite inflation of capital. I am putting this case very calmly and conservatively. It could be put much more forcibly, and it would be easy to make accusations against many of the great utility companies now operating in this country. . . . In most places of the United States the householders and the farmers and the small business men are paying vastly more for that very necessary part of our modern life—electricity—than they have any right to be paying.

It is neither radical nor a violation of any principles of sound business for me to state in definite terms that public servants with a proper regard for the interests of the people themselves must exert every effort to restore the fundamentals of public control. And this applies not only in every state capital but also in the control by the national government over those great sources of power which fall under the jurisdiction of the national government.

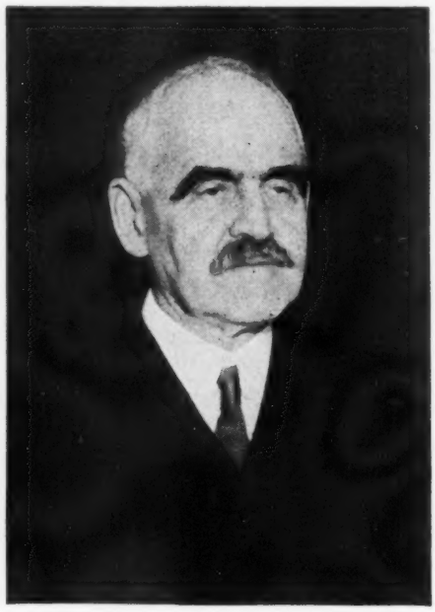
Those who have read the papers these past few days have seen an example of the vast national scope of the public utility structure. Interrelated companies stretch into literally dozens of states. Investors, customers and management constitute a national community of interest of enormous importance. I wonder if it is not true that even those far in the upper reaches of such a structure would themselves recognize the soundness of national public protection of all of the associated factors in this structure.

A very deep study over many years makes it clearer to me with every passing day that where a public service like the transmission of electricity passes beyond state lines and becomes interstate in its actual operation, in such a case the control cannot effectively be maintained by states alone or through agreements between neighboring states. That problem is national in its scope and can be solved only by the firm establishment of national control.

▼ ▼ ▼

Walter C. Baylies Becomes Boston Edison President

Walter C. Baylies, for the past 33 years chairman of the executive committee of the board of directors and long senior vice-president of the Edison Electric Illuminating Company of Boston, was elected president of that



organization on Monday of this week, succeeding the late Charles L. Edgar. A special meeting of the board was held for the purpose of completing the organization, and in addition to the action taken in regard to the presidency, Frank D. Comerford, president of the New England Power Association, was elected to the board and made a member of the executive committee.

Mr. Baylies is a native of Taunton, Mass., and was graduated from Harvard College in 1884. He is senior partner of Amory, Browne & Company, selling agents for a group of leading textile manufacturers and having offices at Boston, New York and San Francisco. He became a vice-president of the Edison company in 1891 and also a director, this being his first association with the organization. For many years he has been an outstanding figure in Boston business circles through his banking, railroading and manufacturing connections. His many directorships include the New England Power Association and the International Paper & Power Company.

In a statement issued by the company Monday afternoon it was pointed out that the election of Messrs. Baylies and Comerford assures the continuance of the policies of the company's late president. Through close association with Mr. Edgar and his long vice-presidency and directorship, Mr. Baylies has been intimately acquainted with the company's policies and activities and familiar with its personnel. Mr. Edgar and Mr. Baylies were directors of the New England Power Association practically since its organization a few years ago. The election of Mr. Comerford to the Edison board will, it is believed, assure the continuation of the existing cordial relations between the two companies and will bring to the Edison board the advantage of Mr. Comerford's intimate knowledge of the industry.

▼

Massachusetts Department to Begin Three Rate Cases

The first week in May has been set by the Massachusetts Department of Public Utilities for starting an inquiry into the rates charged by the Attleboro Steam & Electric Company, the Malden Electric Company and the Quincy Electric Light & Power Company. Reports of the companies are said to show the Attleboro company paid a dividend of 40 per cent last year, while the Malden company paid 27 per cent and the Quincy company 48 per cent.

Death of John B. Miller, Chairman of California Edison

Another heavy loss has been suffered by the electrical industry in the death of John B. Miller, for 31 years executive head of the Southern California Edison Company as president and chairman of the board. Mr. Miller's death took place on Thursday, April 14, on the same day as that of Charles L. Edgar, president of the Edison Electric Illuminating Company of Boston, which was announced in these columns last week.

Mr. Edgar was buried in Walnut Hills Cemetery, Brookline, Mass., on Saturday last, following a service at Trinity Church, Boston, attended by a great throng representing every branch of the electrical industry and every rank of its personnel.

Sketches of the careers of both men will be found in this issue on pages 750 and 751.

▼

Northern Indiana Company Would Unite Rate Cases

The Northern Indiana Power Company recently filed a petition with the Public Service Commission of Indiana asking the commission to investigate all the electric rates now charged by the company and to fix rates for all of its territory. The company points out that although more than 200 rate reductions have been made in its territory during the last ten years, a number of petitions for further reductions have recently been filed and are now pending. Interminable delays and expense will be incurred by the public and by the company by a multiplicity of rate cases, the company declares. Such delay and expense may be avoided to a large extent, the petition points out, by the commission studying the company's territory as a single operating unit.

The company states that it will at the proper time prepare and submit to the commission for its approval schedules of rates which will be just, reasonable and non-discriminatory.

It says that its rates are now substantially uniform throughout its territory except that communities served are classified in three groups as to the lighting rates, with substantially uniform rates for all of the communities in each group. "The rates would be completely uniform at this time," the petition says, "if it had not been for the severe shrinkage of revenue during the last two years, which has made it impossible for petitioner to make further reduction of rates."

The Northern Indiana Power Company supplies 185 communities and rural areas in central Indiana with electricity. Among the larger towns are Huntington, Kokomo, Noblesville, Rochester, Wabash, Clinton, Martinsville, Sullivan, Jasonville, Greencastle and Attica.

▼

Great Lakes Engineers Discuss Rural Costs

That comparisons of rural-line costs have no merit whatever unless their bases and inclusions are identical was the principal conclusion of the rural-line symposium of the overhead systems committee which was the high point of the meeting of the Engineering Section, Great Lakes N.E.L.A., in Chicago last week. The symposium consisted of what might be called a statement of the problem in a paper on the "Fundamentals of Rural Line Design," by E. V. Sayles, Commonwealth & Southern Corporation, followed by four papers on rural service methods, setting forth the practices of the Detroit Edison Company, Public Service Company of Northern Illinois, Milwaukee Electric Railway & Light Company and Indiana General Service Company, presented by G. A. Strohmer, H. F. Eddy, W. H. Johnson and E. W. Hatz respectively.

At a joint session of the power system engineering and overhead system committees studies of primary networks developed for conditions in Milwaukee and in Chicago and the surrounding territory were presented. In neither case was enthusiasm for the network idea manifest. It was held that "justification for the use of a network system must be based upon a comparison of all of the factors involved in a specific application." In such an application in Milwaukee, J. A. Potts said: "The trend for decrease in power generation costs and increase in maintenance labor costs both react favorably to the radial system. This is because electrical losses are higher on the radial system and operating expenses higher on the network system."

▼

Trade Commission Takes Up Sundry Odds and Ends

A 21-year-old transaction was aired before the Federal Trade Commission in its utility inquiry when on April 14 Martin A. Brown of Wilmington, Vt., one of the organizers of the Deerfield Company, a subsidiary of the New England Power Association, testified regarding the conveyance of certain water-power rights, in amplification of testimony given before the commission in March, 1931, by Henry I. Harriman, a director of the association and a member of the firm of Chace & Harriman, which had been active in purchasing lands for power development. Mr. Brown was questioned regarding a reservation of a right to 12,000,000 kw-hr. a year for a long period of time at a stated consideration. This reservation, Mr. Harriman had testified, appeared in a deed in which the Deerfield Company was the grantor and Chace & Harriman the grantees.

The witness declared that in March, 1911, at the instance of Chace & Harriman, he set out to organize the Deerfield Company. He identified a letter showing that he had promised to turn over to Mr. Harriman 147 shares out of a total of 150 shares in Deerfield Company stock on payment of $14,700. The Deerfield Company stock, Mr. Brown testified, was later sold to the New England Power Association by Chace & Harriman for $1,500,000.

The commission also heard testimony from Walter B. Wooden, commission attorney, relative to the activities of the Utilities Publications Committee, which publishes the *Public Utility Reports*. He testified that a fund of $166,000 had been collected for these publications, part of which was obtained from power companies. On the following day Henry C. Spurr, editor of the publication, testified that it is now self-supporting but that a deficit of $27,000 in 1928 was made up by guarantors, the majority of whom represented utility interests. He defended the financial policy of the magazine, explained its utility as an unbiased reporter of commission proceedings and said that the men who had made the reports possible were entitled to the thanks of the public.

The commission will begin hearings on the Northern States Power Company and its subsidiary, the Minneapolis General Electric Company, April 26.

Favorable Developments Conspicuously Absent

FIRST attack of the presidential "jitters" hits the nation as leading Democratic aspirants indulge in acrimony.

Federal Reserve adopts increased buying policy and absorbs nearly $100,000,000 in government securities in a week. The question of when and how holdings are to be liquidated is discreetly barred.

Bonus advocates persist in their inflation cry despite billion-dollar lesson of but a year ago that such payments do not help to improve the situation at all.

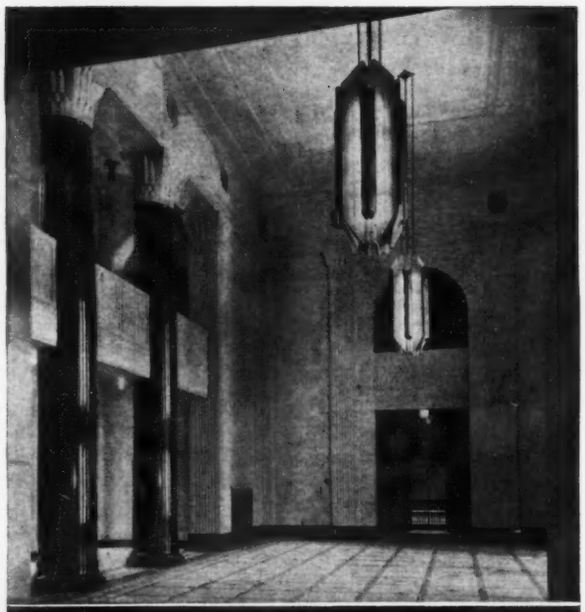
New tax measures advocated, but the idea is still to "soak the rich" without asking who and where they are.

Insull receiverships clear the Chicago atmosphere as the bad news is told and the "Big Three" companies stand firm.

Electrical energy production rises. Car loadings fall again. Security markets sag. Business failures increase. Gold flows overseas at the rate of $20,000,000 a week.

187 KW. TO LIGHT JOSLYN MEMORIAL

Omaha's new art museum, built at a cost of $3,100,000, displays thoroughly modern lighting effects. The two suspended fixtures in the main lobby contain four 500-watt lamps each in the reflectors. The bottom of each fixture contains one 150-watt tubular lamp, and the sides are set off by 32 40-watt tubular lamps hidden by metal strips. Artistic lighting on a similar scale is provided throughout court, foyers, halls, galleries and corridors. Six 1,000-watt and six 750-watt units provide floodlighting of moonlight type. The total rating of the 964 lamps is 187,980 watts.



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Proposal for Tillamook Utility District Fails

An unfavorable report has been made by the Oregon Hydro-Electric Commission upon the proposed creation of a people's public utility district in the county of Tillamook. Following exhaustive investigation of the feasibility of the proposed project, the commission has advised the advocates of the district that the development of hydro-electric power plants on Trask River is inadvisable until engineers can properly test all possible dam sites and the effect on the stream of factors such as the possible impairment of natural storage owing to the removal of the adjacent forest. Such a study, the report says, would require from three to five years.

In discouraging the present erection of the district the commission points out that such a movement would not be advantageous to the public unless measures could be satisfactorily concluded which would enable the citizens of the district to acquire ownership of the properties of the Mountain States Power Company, the utility now serving the area under consideration. The commission believes that the people of the district could profitably operate the fuel-burning plant of the company named, if obtainable by purchase or condemnation at a fair valuation and assuming that financial conditions would permit the sale of the necessary bonds.

The reports concludes: "The engineers further point out that it would be possible for the district to construct and operate a complete new steam generating plant and transmission system . . . and furnish electrical service at rates approximately 20 per cent below the present rates, if the entire present electrical load were secured."

▼

Two Utility Bills Are Beaten in Mississippi

A 2 per cent tax on sales, including sales of electric power, has been defeated by the Mississippi Legislature after two months' consideration. The vote in the House was 77 yeas and 55 nays, lacking only two of the required three-fifths majority. Defeat also met a measure aimed at customers who put "jumpers" around meters. Some members thought the bill should include a clause that would prevent meter readers "over-reading" them, and this unrelated objection prevailed.

Virginia Commission Has House's Rate Resolution

So far the Virginia Corporation Commission has taken no action on the resolution passed by the Lower House at the recent legislative session and certified to the commission requesting that body to institute a state-wide investigation of utility rates (ELECTRICAL WORLD, March 19, page 514).

The bill broadening the scope of the commission over water-power development passed the Senate before the Legislature adjourned and has been signed by the Governor. No important utility legislation resulted from the session.

▼

Ohio Power Company Acquires Nine Properties

Permission to purchase and capitalize nine light and power companies in Ohio has been asked from the Ohio Public Utilities Commission by the Ohio Power Company. The acquired properties are the Western Reserve Power & Light, the Reserve Power & Light and the New London Power companies, all with headquarters in Cleveland and previously controlled by the Keystone Waterworks & Electric Company, New York; the Buckeye Public Service Company of Columbus and its subsidiaries, the West Jefferson Power & Light, the Ashville Light & Power and the Central Utilities companies; the Ohio Northern Public Service Company of Bowling Green and the General Utilities Company of Deshler, both formerly owned by the Atlantic Public Service Associates of New York.

Proposed new rates for these communities, based on the first 40 kw.-hr., are: For municipalities of more than 500 population, 7 cents; for municipalities of less than 500 population, 8 cents; rural communities, 8 cents.

The Columbus Railway, Power & Light Company has contracted for the purchase of three southern Ohio power companies and plans the acquisition of three other utilities. The Southern Ohio Electric Company, the Adams County Power & Light Company and the Peebles Power Company, all contiguous to present holdings of the Columbus company, are the properties contracted for. Two properties on the West Virginia side of the Ohio River—the Point Pleasant Water & Light Company and the River Counties Power Company—are proposed for acquisition, along with the Hillsboro (Ohio) Ice & Coal Company.

The Columbus company, it is reported, will issue ten year 5½ per cent bonds for $4,500,000, to be marketed through a group headed by the Chase-Harris-Forbes Corporation.

New York Edison Rates Must Have Fair Trial

So says state commission, Chairman Maltbie again telling the advantages of negotiated charges to consumers.

No change in the rates promulgated by the New York Edison and its allied companies last summer will be considered until these rates have had a fair trial. This decision has been made by the New York Public Service Commission in answer to the protests against these rates which, as noted from time to time in the ELECTRICAL WORLD, have been made by the Washington Heights Taxpayers' Association and other bodies. The commission said further that it is investigating the results of the new rates and that "very shortly the commission will cause to be made public the results under the new rates for eight months and will consider the complaints against them not already passed upon."

Repeating his often-expressed preference for negotiation over litigation in establishing rates, Chairman M. R. Maltbie, who wrote the decision, said:

> Of course, reductions by negotiations do not commit the commission in any way except that there shall be a reasonable opportunity for experience to show what the results will be. There has been no instance of any commitment upon the part of the local authorities, the consumers, the company or the commission beyond this point, and the commission has repeatedly announced that if, after a reasonable trial period, it is apparent that changes should be made in the rates, further negotiations will be had or formal proceedings started.

Chairman Maltbie disclaimed any intention of putting forward negotiation as an infallible solution of the rate question, workable in every case before the commission, pointing out that 63 rate proceedings are now on the commission's calendar.

He renewed in his opinion the pledge that if the results of operation in New York City under the new rates did not justify the predictions that they would save the city's consumers $6,000,000 a year, further reductions would be made.

▼

Prof. Levitt Loses Suit to Force Line Extension

Rejection of the plea of Prof. Albert Levitt, of Redding, Conn., that the Connecticut Light & Power Company should be forced by the Public Utilities Commission of the state to extend a service line 3,000 ft. to his residence with no charge to him outside of the company's regular rates for energy was embodied in a decision of the State Supreme Court of Errors, made on April 12. (See ELECTRICAL WORLD, December 26, 1931, page 1117.) In a long ruling the court said, after explaining the company's rules for extensions, approved by the commission:

> The basic claim of the plaintiff is, stated broadly, that a public utility company is obliged to serve all within the territory it is chartered to serve without discrimination in rates provided it can do so without materially affecting its financial or rate structure. An examination of the numerous authorities cited by him does not substantiate this claim.
>
> If a company were under a duty to build extensions so long as its financial or general rate structure was not affected, it could very likely for a time build extensions as they were requested, but a situation would inevitably be reached where the construction of further extensions would affect its financial and general rate structure.

▼

Florida Utilities Tax Is Upheld by Excise Levy

The Florida tax of 1½ per cent on the gross revenue of public utilities, including those operated by municipalities, is an excise and not an income tax, and the law enacted in 1931 is constitutional, according to an opinion by the Circuit Court, handed down last week.

The decision was given in a suit brought by several cities seeking an injunction to prevent enforcement of the law (ELECTRICAL WORLD, April 2, page 597). The cities contended that the act is unconstitutional and that the tax is confiscatory. Attorneys for the cities announced that an appeal will be taken to the State Supreme Court.

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High Court Gets Idaho and South Carolina Tax Cases

Whether a state can levy a kilowatt-hour tax on exported electrical energy as maintained by Idaho and South Carolina came before the Supreme Court of the United States on April 13. The Idaho case, in which the Utah Power & Light Company appealed against the enforcement of the statute and obtained from a federal court in Idaho a temporary injunction against the collection of the tax, was taken up for argument.

In the South Carolina case, in which the chief light and power companies of the state have joined hands to contest the payment of the half-mill tax, the court refused to hear argument on the merits of the cases, confining the issue to the question of whether the lower court in refusing to grant an interlocutory injunction to restrain enforcement of the statute abused its discretion. Decision on this point was against the companies.

Coming Meetings

Southwestern Division, N.E.L.A. — Arlington Hotel, Hot Springs, Ark., April 26 and 27. S. J. Ballinger, San Antonio Public Service Co., San Antonio.

American Welding Society—New York, April 27-29. M. Kelly, 29 West 39th St., New York.

Missouri Association of Public Utilities—Excelsior Springs, Mo., April 28-30. Jesse Blythe, 103 West High St., Jefferson City, Mo.

National Electric Light Association—Engineering Section committee meetings, Hotel Pfister, Milwaukee, May 1-4. A. J. Marshall, 420 Lexington Ave., New York.

American Institute of Electrical Engineers—District meeting, Providence, May 4-7; summer convention, Cleveland, June 20-24. Acting secretary, 33 West 39th St., New York.

National Electrical Manufacturers' Association—Hot Springs, Va., May 15-20. A. W. Berresford, 420 Lexington Ave., New York.

Middle West Division, N.E.L.A. — Muehlebach Hotel, Kansas City, Mo., May 18-20. Thorne Browne, 1527 Sharp Bldg., Lincoln, Neb.

East Central Division, N.E.L.A.—Commodore Perry Hotel, Toledo, Ohio, May 24-27. D. L. Gaskill, 603 Broadway, Greenville, Ohio.

National Electric Light Association — Atlantic City, N. J., June 6-10. A. J. Marshall, 420 Lexington Ave., New York.

Pacific Coast Electrical Association—Hotel Huntington, Pasadena, Calif. June 14-17. K. I. Dazey, 447 Sutter St., San Francisco.

Canadian Electrical Association—Manor Richelieu, Murray Bay, Que., June 15-17. B. C. Fairchild, 409 Power Bldg., Montreal.

New England Division, N.E.L.A.—Mount Washington Hotel, Bretton Woods, N. H., July 11-13. Miss O. A. Bursiel, 20 Providence St., Boston.

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Six Companies Named to Begin Pennsylvania Inquiry

W. D. B. Ainey, chairman Pennsylvania Public Service Commission, has announced that the following companies will be the first ones called upon in the rate investigation about to begin, as reported last week (page 674): Duquesne Light Company, West Penn Power Company, Philadelphia Electric Company, Scranton Electric Company, Pennsylvania Electric Company of Johnstown, and the Pennsylvania Power & Light Company as affecting the Harrisburg and Lancaster territories.

Part of the widespread agitation in western Pennsylvania for lower energy rates is being taken by the Pittsburgh City Council, which to negotiations for a reduction to private consumers added last week a special appeal to the Duquesne Light Company for a cut in the price for street lighting. The Council has rejected an offer from the company to reduce by 1 cent a kilowatt-hour the first step in the residential rate. The city spends about $800,000 a year for street lighting, and a reduction of 20 per cent on the basis of a five-year contract is one of the councilmen's suggestions.

Utility Stocks Rally Slightly

Though general security markets slumped badly this week, American Telephone & Telegraph Company common crossing 100 and leaving Homestake Mining the only active common stock to sell above that point, the electric utilities fared a little better. The "Electrical World" average of 50 representative stocks was 25.3 for the week, as against the low of 24.8 touched previously. Clarification of the Insull situation helped.

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Bond & Share Reports a Satisfactory Year

Earnings equivalent to $3.05 a share on the total of outstanding capital stock are reported by the Electric Bond & Share Company for the year ended March 31, 1932. Net income for that period was $23,412,235. After payment of preferred-stock dividends of $8,249,308 and common dividends of $6,901,035, there was chargeable to surplus, therefore, $8,261,892. Total surplus is $373,848,272.

Current assets reported are $34,521,842, while current liabilities total $6,317,326. Bond & Share's indebtedness consists only of these current liabilities, since it has no funded debt, bank debt, indorsements or guarantees. The report states that none of the company's investments or other assets are pledged or encumbered.

Of the company's investment holdings, American Power & Light has no bank or other loans payable and no long-term debt maturing prior to 2016; American Gas & Electric has no bank or other loans payable and no maturing long-term debt prior to 2028; National Power & Light has no bank loans or other loans payable and no long-term debt matures before 2026; Electric Power & Light has no bank or other loans or long-term debt maturities before 2030, and American & Foreign Power has no long-term debt maturing before 2030, although it has a $50,000,000 bank loan payable October 26, 1932, and a $30,000,000 obligation to Bond & Share.

Total Bond & Share assets are carried at $555,741,791.

The Electric Bond & Share Company, it is officially announced, has arranged for extension of the maturity of the $50,000,000 bank loans of the American & Foreign Power Company (now due October 26, 1932) to October 26, 1933, and for the extension of the $21,250,000 bank loans of the United Gas Corporation (now due July 20, 1932) to July 20, 1933.

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General Electric Orders Off 44 per Cent for Quarter

Orders received by the General Electric Company for the first quarter of 1932 amounted to $33,404,642, compared with $60,366,297 for the corresponding three months of last year, Gerard Swope, president of the company, announced at the annual meeting of stockholders on Tuesday. Sales billed for the first three months of 1932 amounted to $37,876,399, compared with $61,959,800 for the corresponding period last year.

Profit available for dividends on common stock for the first quarter of 1932 was $4,508,667, compared with $10,844,334 for the same three months last year, which is equivalent to 16 cents per share in 1932 and 38 cents in 1931 on 28,845,927 shares outstanding in both periods. The quarterly dividend on the common stock, payable on April 25, is 25 cents per share, compared with 40 cents per share paid a year ago.

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New Accounting System Goes in Effect in Oregon

The expected order alluded to in previous issues of the ELECTRICAL WORLD regulating accounting practices of electric and gas utility companies of Oregon for their merchandising and jobbing operations has been issued by the State Public Utilities Commissioner. Prescribing a somewhat more elaborate system of accounting for merchandising than has been in effect heretofore, the order makes its principal departure from previous practice in decreeing that the net profit from merchandise and jobbing shall be included in "income from non-operating property." It says:

The primary object of the utility is to manufacture, furnish and deliver electrical energy and gas to its consumers under rates, rules and regulations promulgated by the commission. The sale of certain merchandise is closely linked with the development of the utility business. The business of the utility should be so developed as to fit into the most economical scheme of operation, but the rates of the utility should not be burdened with the cost of selling appliances.

It is apparent that the utilities are overlooking the primary object of their business and have entered most strenuously into the merchandising field and have not confined themselves to load-building equipment but have pushed non-essential equipment by expensive house-to-house canvassing and by other merchandising methods.

It appears that there should be a segregation of the accounting of the merchandising departments of the power and gas companies from their public utility functions, and all items of expense incurred in the merchandising of appliances should be charged to this activity.

The new classification was made effective as of April 1 and requires reports of merchandising and jobbing operations every 90 days.

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Canadian Utilities Cut Dividends

Shawinigan Water & Power Company has placed its common stock on an annual dividend basis of $1 a share, against $2 previously paid, by declaring 25 cents a share for the quarter ended on March 31. Directors of the Quebec Power Company have announced that the dividend will be reduced to an annual basis of $1.50 a share, against $2, the rate in the previous quarter, and $2.50 prior to that time.

Insull Company Difficulties Culminate in Several Receiverships

WITH the appointment of receivers for the Middle West Utilities Company, Insull Utility Investments, Inc., the Corporation Securities Company of Chicago and the Mississippi Valley Utilities Investment Company, the difficulties of the Insull interests culminated late last week. Following conferences with Chicago and New York bankers and with Owen D. Young, Samuel Insull joined in the plea for a friendly receivership of the Middle West Utilities. The others followed. An extended account of the financial difficulties that have led to this situation and of the present outlook for their dissipation will be found on page 728 of this issue.

Underlying Middle West properties are reported little affected. Eastern companies of the National Electric Power group are said to have been set up as an independent organization under Harry Reid, president of National Electric Power.

Emphatic reiteration of the soundness and independence of the "Big Three" Insull companies has been made by Mr. Insull to assure the security holders of Commonwealth Edison, People's Gas Light & Coke and Public Service of Northern Illinois that these properties are not involved and are not likely to drift into similar difficulties.

Contrary to earlier reports, the impending maturity on June 1 of $10,000,000 in Middle West Utilities notes was not the direct precipitating cause of Insull's Middle West difficulties. At the end of 1931 the companies now in receivership had pledged $439,634,000 of their investments and borrowed an aggregate of $112,548,000. The refusal of the banks to extend or expand these loans and the continued drop in security market prices brought on the failure.

As one of the three receivers for Middle West, Mr. Insull is planning to continue aggressively his efforts for conservation of the property. It is expected that a reorganization plan for Middle West may be offered on or before June 1.

While the petitions against Insull Utility Investments and Corporation Securities indicated total bank loans exceeding $61,000,000, they gave no estimates of the present market value of the companies' assets. However, the annual statements published in February indicated a combined shrinkage of around $333,000,000 in assets that originally represented about $405,000,000. The present depreciation is even greater as the result of further decline in market prices.

Middle West Utilities Company, out of $274,100,218 securities on its books at the end of 1931, had pledged $87,433,555 and lent $16,628,810. Of the total, $271,996,210 was in permanent investments, of which $85,588,702 was pledged and $16,370,498 lent. The balance included $574,400 borrowed securities and $373,004 collateral securities held, while the remainder were holdings of the company's own securities.

Of bank loans, $21,961,000 was secured and $7,088,178 partly secured. There was a $10,000,000 maturity of 5 per cent serial debentures due on June 1. The company had a contingent liability of $5,000,000 on a note of a subsidiary and had deferred payments of $4,972,028 on purchases. It had further advanced $25,176,098 to subsidiaries and held cash of only $2,626,851.

Court Upholds Bond Issue of Associated Gas & Electric

Supreme Court Justice Alfred Frankenthaler of New York has refused to grant an injunction sought by the Equity Acceptance Corporation to restrain the Associated Gas & Electric Corporation from issuing $40,000,000 worth of bonds. In applying for the injunction the Equity Acceptance Corporation declared that the issuance of the bonds would injure its rights as the owner of bonds in the Associated Gas & Electric Company, which in turn owns the corporation. Justice Frankenthaler found this could not be sustained.

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New York Metal Prices

	April 13, 1932 Cents per Pound	April 20, 1932 Cents per Pound
Copper, electrolytic	5.75	5.75
Lead, Am. S. & R. price	3.00	3.00
Antimony	6.00	5.87½
Nickel, ingot	35.00	35.00
Zinc, spots	3.15	3.10
Tin, Straits	18.40	19.33
Aluminum, 99 per cent.	23.30	23.30

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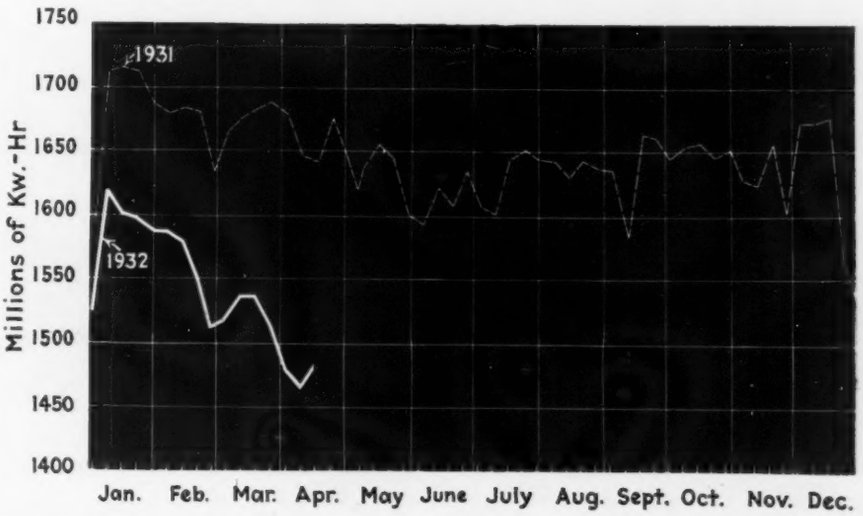
Modest Rise in Weekly Output



ENERGY output of central electric light and power stations for the week ended April 16 was somewhat greater than in the preceding week, according to estimates announced by the National Electric Light Association. The total for the industry as a whole was 9.8 per cent less than in the corresponding week last year.

The deficiency is decidedly larger than it was in January, when, according to the monthly figures of the U. S. Geological Survey, the output averaged 5 per cent less than in 1931, but the change from the 11.9 per cent of the week of April 2 is at least in the right direction.

With the exception of the Chicago district all the regional percentages, while still negative, show a closer approach to last year's output than in the preceding week.

Weekly Output, Millions of Kw.-Hr.

	1932	1931	1930	1929
April 16	1,481	1,641	1,733	1,709
April 9	1,465	1,647	1,715	1,697
April 2	1,480	1,680	1,708	1,663
March 26	1,515	1,689	1,723	1,680
March 19	1,538	1,682	1,722	1,683

Per Cent Change from 1931

Region	Week Ended April 16	April 9	April 2
Atlantic seaboard	—3.0	— 5.6	— 6.6
New England alone	—5.3	— 8.5	— 6.6
Central industrial	—13.5	—14.8	—15.7
Chicago district	— 9.7	— 8.8	—12.6
Pacific Coast	—12.9	—13.8	—15.2
United States	— 9.8	—11.1	—11.9

Common Neutral Approved for California 5-Kv. Lines

After a trial period which began in 1928 and involved a careful study of performance elements the California Railroad Commission early this month granted the right to power companies, provided that certain construction rules are followed, to use a common primary and secondary neutral conductor on distribution systems with three-phase, Y-connected, four-wire primary circuits of voltages not to exceed 5,000 between phase conductors. This ruling, upon the basis of observed factors during the experimental period, will mean reduced line costs, improved safety and little if any increase of telephonic interference.

Upon the cost figures developed in eleven areas and involving an estimated total of $308,453, a direct saving of $33,075, or 10.7 per cent, was made. Had only new construction been involved instead of a considerable amount of rebuilding, the savings would have been 17.8 per cent. In general the greatest savings are to be realized in well-built-up areas with high load densities.

The commission calls for a low ground resistance, not to exceed 3.5 ohms on the system; the formation of a neutral grid wherever practicable, and having two or more return paths to the source of supply such that a break in one will leave combined paths of equal conductivity. Grounds on the neutral grid are to be at intervals not exceeding 1,500 ft. and on branch runs not to exceed 800 ft. It is also stipulated that the common-neutral line conductor shall have a minimum area approximately 50 per cent of the largest related primary phase conductor.

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British Electrical Trade Starts Year Poorly

Figures for February and March show that the British electrical manufacturing industry experienced a period of exceedingly slack trade during these months. The only notable contracts received during February were for a turbo-alternator of 10,000 kw. capacity for Madras and for two smaller generating sets for Canada.

February's unemployment figures revealed a serious increase in comparison with January. While the actual percentages of unemployment in January were 15.1 for electrical engineering, 15.1 for wiring and contracting and 12.3 for cable and lamp manufacturing, the corresponding figures in February were 17.2, 20.3, and 14.6. The large increase in the wiring and contracting trades is, to a certain extent, seasonal.

No improvement occurred in the depressed condition of the trade. Exports in the first two months of the year amounted to £1,510,000 ($7,550,000 at par), as against £2,350,000 ($11,750,000) in the first two months of 1931, while values of imports for the same periods were respectively £708,000 ($3,540,000) and £1,066,000 ($5,330,000).

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Work on Hoover Dam Faces Delay by Appropriation Cut

Work on the Hoover Dam project faces the possibility of serious delay and of possible large losses to the government because of a proposed cut in the appropriation for carrying it on. At the present rate of progress $8,000,000 will be required up to February 1 of next year. The budget approved $10,000,000. This was cut to $8,000,000 in the House but restored by the Senate committee. When the Senate recommitted the bill with instructions to reduce the total by 10 per cent, the committee cut the amount to $6,000,000. Such a reduction would compel the discharge of nearly half of the 3,400 men now employed, according to the president of the Six Companies, constructor, and it is declared that it might jeopardize the diversion of the river within the scheduled period.

If the diversion of the river is not effected, it will be necessary to close down the work for six months. A reduced appropriation would also, it is said, prevent the orderly delivery of materials. Extension of the contract would entail additional expense, and the government also would lose by delaying the date when revenue would begin to come in from sale of power.

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Soviet Progress in Power Production

Electric power production in Soviet Russia during the first quarter of the current year increased 45.5 per cent compared with 1931, it is reported on the basis of preliminary statistics revealed at a meeting of the State Planning Commission. This is regarded as a satisfactory accomplishment in accordance with the widely discussed five-year plan.

Progress in the power industry is more rapid than in some other important lines, where serious shortcomings exist, according to the same report. Metal production is up to 50 per cent of schedule; the building of new factories and railroads is stated to show defects in planning and performance; the repairing of tractors is seriously behind requirements; transportation is 10 to 15 per cent below the program. The big blast furnace plant at Magnetogorsk, on the contrary, is producing rapidly and the Stalingrad tractor works are almost up to the rated output.

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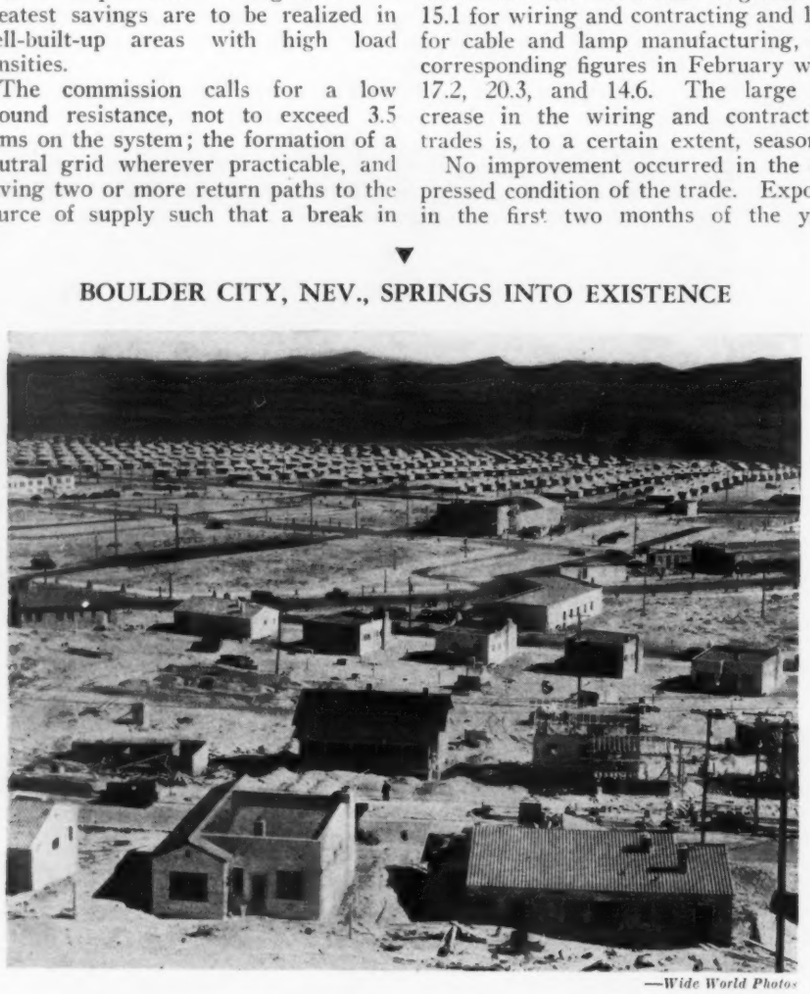
BOULDER CITY, NEV., SPRINGS INTO EXISTENCE



—Wide World Photos

Five thousand men—and presumably many families—will inhabit the new city that Uncle Sam has built almost over night where the Colorado River separates Nevada from Arizona and where a million horsepower may some day revolutionize once silent wastes.

Refrigeration Bureau Plans for Convention

According to present plans, the Electric Refrigeration Bureau will have a dominant position in the exhibition hall at the June convention of the National Electric Light Association. A space 150 ft. by 75 ft. directly in front of the stage on the main auditorium floor has been set aside for this bureau. According to a recent N.E.L.A. announcement, this area will be considered as a workshop wherein utility men may find out just how a local refrigeration bureau may be organized, what activities it can sponsor and the probable budget needed to carry on such work. The exhibit will be entirely institutional in character.

The next major activity of the Electric Refrigeration Bureau has been set for the month of May, which has been designated as "banner sales month." In the 30-day period from May 2 to 31 the national sales objective has been set at 200,000 refrigerators, or 20 per cent of the entire year's quota. The success of "banner sales month" is largely predicated, in theory at least, upon the degree to which distributors, dealers and salesmen handle the ten-million-call campaign conducted in March.

The national magazine advertising of the bureau, as well as that of the manufacturers, is concentrated from the middle of April to the end of May and is designed to back up local activities to the limit. Local bureaus have been advised that their newspaper advertising should be correspondingly heavy, approximately one-fifth of the year's budget, since the sales goal is one-fifth of the year's total sales.

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Brockton Merchandisers Hurdle the Depression

Mutually profitable trade co-operation, planned campaigns, prices, terms and service rates which appealed to the public as fair, and the capitalization of four years' use of the utility district representative system, resulted in the sale of $23.34 of electrical appliances per residential customer in 1931 in the territory of the Edison Electric Illuminating Company of Brockton, Mass. The major devices sold included 810 ranges, 525 refrigerators and 172 water heaters on a system having 25,662 residential customers. The territory represents a typical cross-section of Eastern American industrial conditions. Fifty per cent of the company's employees use electric refrigerators and 40 per cent cook electrically. Profitable co-operation was the keynote of the year's work, which is being pushed on the same lines during 1932. The company is under the management of the Stone & Webster Service Corporation.

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Four-Year Service Plan for G. E. Refrigerators

Based upon the performance records of four years of actual use and upon a sales volume of $300,000,000 worth of electric refrigerators to more than 1,250,000 purchasers, the General Electric Company announced this week that henceforth the service contract protecting each new buyer against all service and repair charges on the monitor-top mechanism will run for four years. In case of failure or trouble a new factory unit is to be installed without charge should failure occur within the contract period.

Prices have been reduced on General Electric refrigerators. A down payment of as little as $10 will secure delivery. A half-million-dollar advertising campaign is planned.

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Domestic Market Data Compiled by Government

Compilation of the most recent data available indicating the location, size and purchasing power of domestic markets for the products of American industry has been made in a report, "General Consumer Market Statistics," made public last week by the Department of Commerce. The report is published as the first supplement to the "Market Data Handbook of the United States," recently made available, and was prepared by Charles B. Elliot, Domestic Regional Division, under the direction of E. F. Gerish.

All of the information included in the supplement falls within the years 1930 and 1929, making the various tables closely comparable with one another from the standpoint of time and so of particular use in marketing studies where several different factors are to be taken into account.

Approximately how much money the people of a given section maintain in the bank, what proportion of them file income tax returns, how many automobiles they own, the number of wholesale and retail outlets that serve them are a few of the fundamental factors entering into an appraisal of marketing possibilities which this new supplement brings together. Population, both city and rural, is shown for each county in the country as of the 1930 census count. Value of manufactured products, value added by manufacture and worth of mine output are reported on the basis of 1929 returns. Savings deposits, postal receipts and users of telephones are also reported in terms of counties.

Major New Construction This Week

ELECTRIC pumping machinery to cost about $135,000 required for proposed reclaimed sewage pipe line by Board of County Supervisors, Los Angeles, Calif. Motors of 250, 200, 150 and 100 hp. capacity, with automatic controls, will be used.

Sturgis, Mich., will install water-wheel-generator unit and auxiliaries, transformers, etc., for a city-owned hydro-electric power station. Estimated cost $100,000.

Motors and controls, conveying and elevating machinery and other electrical equipment needed for a proposed $275,000 grain elevator at Akron, Ohio, for Quaker Oats Company.

Bids asked by Department of Commerce, Aeronautics Branch, Washington, D.C., until May 12 for complete standard airway electric rotating beacons for Chicago-Twin Cities Airway.

Electric churns, pasteurizing machinery, washing machines, conveying equipment with miscellaneous dairy machinery, costing about $45,000, will be installed in new plant of Dairy Delivery Company, San Francisco, Calif. A $225,000 project.

Until May 11 bids are being asked by Board of Water Commissioners, City and County of Denver, Colo., for six synchronous motors and six complete controls for University Park pumping station. Total 3,000 hp.

Electric pasteurizing machinery, bottling equipment, washing machinery, motors and controls, switchboard and accessories will be installed in a $100,000 dairy plant to be constructed by Driggs Dairy Farms, Inc., Toledo, Ohio.

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Delinquent Electrical Accounts

(National Electrical Credit Association)

Number of Accounts Reported

Division	March 1931	March 1932	Per Cent Inc. or Dec.	Three Months 1931	Three Months 1932	Per Cent Inc. or Dec.
New York	313	287	— 8.3	815	713	—12.5
Middle and Southern Atlantic	145	155	+ 6.9	412	369	—10.4
New England	95	145	+52.6	286	374	+30.7
Central	675	628	— 7.0	1,952	1,608	—17.6
Total	1,228	1,215	— 1.0	3,465	3,064	—11.6

Total Amounts Reported

New York	$40,230	$29,632	—26.3	$115,908	$70,008	—39.6
Middle and Southern Atlantic	23,560	9,211	—60.9	56,873	34,212	—39.8
New England	7,884	11,504	+45.9	26,395	31,592	+19.6
Central	64,225	43,272	—32.6	184,275	129,004	—30.0
Total	$135,899	$93,619	—31.1	$383,451	$264,816	—30.9

Union of Vermont Subsidiaries

The Green Mountain Power Corporation has been authorized by the Vermont Public Service Commission to purchase and operate the Vermont assets of the Grafton County Electric Light & Power Company and the New England Power Company of Vermont. The consolidated companies are all subsidiaries of the New England Power Association. The Green Mountain operates from Lake Champlain down the Winooski Valley to the Connecticut River.

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Oklahoma Byllesby Charters Carry

By a majority of nearly three to one, citizens of Shawnee, Okla., at a special election last week, voted a renewal of the 25-year electric franchise to the Oklahoma Gas & Electric Company. Shawnee is the fifth city in Oklahoma recently to grant such a franchise.

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Rate Penalties and Discounts

An investigation has been ordered by the New York Public Service Commission into the practice of all utility companies in the state with respect to charging penalties for deferred payment of bills and allowing discounts for prompt payment. The commission has sent to all utility corporations a copy of five proposed rules, one forbidding a penalty and the others regulating discounts.

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Indiana Utility Charged with Fraud

Charging fraud and seeking $90,000 in damages, a suit naming the Public Service Company of Indiana as defendant has been filed in Circuit Court at Bloomington, Ind., by the Board of County Commissioners. The complaint alleges that the utility "did wrongfully and fraudulently plan to prevent a legal assessment of its property" owned in Indiana, employed "persons especially skilled and practiced in the part of deception and possessed of the power of persuasion" to represent it in the preparation of its tax returns and to "procure members of the State Board of Tax Commissioners to violate the laws of Indiana and breach their public trust in the matter of assessing said public utility company."

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Plenty of Water in Colorado

Late and repeated snows which are well packed have fallen on Colorado's eastern watershed, tributary to the South Platte River, insuring adequate spring and summer run-off. Early precipitation in northern, western and southern portions of the state was of a record-breaking kind, but the eastern section was faced with serious water shortage until the February and March snowfall relieved the situation. A survey completed early in April by the United States Weather Bureau at Denver forecasts 95 per cent normal flow in the South Platte. Elsewhere water supply will be 14 to 67 per cent above normal.

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SPIRIT OF ELECTRICITY, NEW STYLE

A massive, modernistic conception of the Spirit of Electricity, wrought in stainless steel, will form a symbolic masthead for the new Niagara-Hudson office building in Syracuse, N. Y. (*Electrical World*, June 13, 1931, page 1089). Its wings (not shown above) will rise 26 ft. from the statue's base. Concealed light totaling 5,410 watts will illuminate it.

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Baltimore Joins Light-Saving Cities

Reduction in candlepower and the discontinuance of many street lamps will bring about a saving to Baltimore of about $55,000 this year, according to the City Engineer. Still further reduction in candlepower and the number of lamps is being considered.

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Starkville (Miss.) Case Is Heard

Hearing of the case of the Mississippi Power Company against the city of Starkville and the Fairbanks-Morse Company, in which the Mississippi company is seeking to enjoin the defendants from issuing bonds of $112,000 for erecting an electric light plant at Starkville, is near completion in federal court at Aberdeen, Miss. The power company in 1925 purchased from Starkville the electric light plant, for which $70,000 was paid, and Starkville granted a franchise for 25 years.

Rock Island Dam May Be Raised

Wenatchee (Wash.) City Commissioners have under consideration an ordinance to give the Puget Sound Power & Light Company, owner of the Rock Island Dam, permission to raise the level of the Columbia River on shorelands owned by that city. The present level of the dam at Rock Island is 581 ft., but it is not built to the maximum height allowed by the Federal Power Commission, which is 599 ft. The company would agree to indemnify Wenatchee for any damage arising within ten years.

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Electric Light for Mammoth Cave

By means of a hole drilled through 267 ft. of solid rock Kentucky Utilities Company wires now bring electric light to a 3,000-ft. route in Mammoth Cave, Ky., including several especially fine formations. By the use of three-way switches 500 ft. is lighted at a time with lamps of 100 to 200 watts. The Westinghouse company made the installation, the first modern lighting to be used in the cave.

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Domestic Rates Cut by Danville, Va.

Danville (Va.) users of electricity have been informed that their next monthly bills will show a $14\frac{3}{4}$ per cent reduction. This announcement followed action by the Danville City Council in setting the base rate at 6 cents a kilowatt-hour instead of 7 cents, with a cut to 3 cents after the first 50 kw.-hr. The reduction will save customers $35,000 a year.

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Territorial Rights in Wisconsin

The Public Service Commission of Wisconsin has been asked to decide whether the Water and Light Commission of Plymouth may extend its lines to nine towns in Sheboygan County and occupy additional territory in Plymouth and Sheboygan Falls. The city asks the right to cross over territory served by the Wisconsin Gas & Electric Company and Wisconsin Power & Light Company, which serve farms and hamlets 30 miles away. The Plymouth utility buys power from the Wisconsin Power & Light Company and operates only a distributing system. Its petition follows a failure to agree on a division of territory with the Wisconsin Gas & Electric Company, which has started moving its Plymouth offices to West Bend, where it recently purchased the Wisconsin Public Utility Company.

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California Commission Criticised

Voicing criticism of the California Railroad Commission, the Kern County grand jury, in a report recenty issued, says: "Business profits have very gen-

erally disappeared except to the great public utility corporations whose profits are fostered and protected by state laws and only tempered in a very mild degree by the State Railroad Commission. May we not offer the observation that it is indeed regrettable that the commission does not adjust public utility rates for commodities furnished with greater facility to meet and accommodate the changed conditions of servitude imposed upon the public? The relief, if granted, is tardy and fails to reduce the stress and strain upon the public purse in time to avoid distress to the farmer and toiler."

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Steel-Frame Housing Takes Another Form

The arc-welded steel-frame house, acclaimed last summer not only as an outlet for 3,000,000 tons of structural steel but also as a major intrinsic improvement in housing, has appeared in another form in Oberlin, Ohio. This structure may be termed the shop-fabricated, custom-built home. The builder, Steel-Bilt Homes, Inc., while equipped to handle mass production of housing panels, has specialized in individual residences. Myron T. Hill is the architect. This is the first time that this builder has used arc welding, although bolted steel houses have been put up in northern Ohio by this concern for several years. Attention focused on the arc-welded steel-frame house fabricated entirely in the field at a cost of less than $100 more than wood framing caused this firm to consider welding.

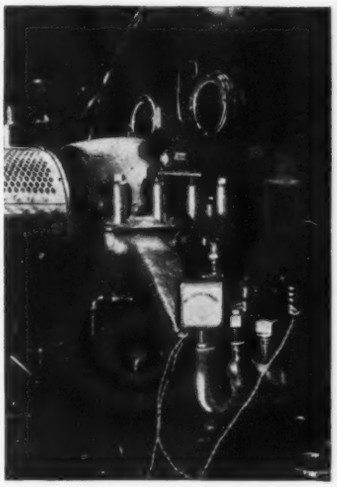
Four years ago a bolted, shop-fabricated steel-frame dwelling cost roughly 25 per cent more than brick or tile. Standardized shop detail brought this down to 6 per cent, and the use of arc welding has further reduced costs slightly more than 3 per cent. The field-welded house, not completely fireproof, now costs hardly 2 per cent more than traditional methods. Were it not for the limitations of handling, transportation and street widths an entire wall could be shop-fabricated in one piece. Structural shapes were cut to length and the members for each wall panel lined up in a jig to insure accurate alignment, speed of assembly and welding. With this method little scaffolding was necessary on the building site. By doing almost all the welding under cover inclement weather was eliminated as a factor to be considered. Welding equipment manufactured by the Lincoln Electric Company, Cleveland, was used.

Nine tons of steel were employed, and the erection cost ran $90 a ton as against $120 a ton by other methods. The contractors hope to reduce this figure another $20 a ton when shop welders become more familiar with requirements for this type of work.

Vibrations and Strains Accurately Determined

Measurements of vibrations and strains have been greatly simplified and the accuracy of the determinations considerably improved through the recent application by General Electric engineers of the electric micrometer principle to these classes of work.

Vibration determinations in the case of heavy machinery such as turbines may now be measured in thousandths



of an inch, it is asserted. For such work the instrument case is bolted to the machine under investigation. Within the case there is suspended a block of lead. Two tension springs on the top and four springs on each side of the weight hold it in position. The outside shell of the detector vibrates at the same period as does the machine to which it is attached, but the lead weight, because of its mass and low natural frequency, remains fixed in space.

In the lead weight are embedded two coils, on opposite sides. In front of each coil is an adjustable piece of magnetic steel fastened to the outer shell. The coils in the weight are energized by 500-cycle alternating current, and the air gaps between the coils and pieces of magnetic steel are adjusted so that the two coils are electrically balanced—the amount of current through the coils depending on the distance of the steel pieces from them. There is, then, a zero reading of the indicating instrument when there is no vibration.

Vibrations of the machinery to which the detector is attached cause a swaying of the outer shell of the instrument and, therefore, varying distances between the coils and the magnetic pieces. These differences cause a variation in the flow of the 500-cycle current—differences that, in the indicating or recording instrument, are translated into thousandths of an inch in vibration readings.

Still another recent adaptation of the electric micrometer principle is a gage for measuring strains in railroad tracks, bridges and other structural members under load. The gage, with a 2-in. expansion between the mounting holes, can be bolted or clamped to the piece under investigation. The coils are mounted in cylindrical holders which slide inside the block. The block and armature are fastened to one side and the coils to the other side. A 2,000-cycle excitation current is used with the gage, thereby making it possible to record with an oscillograph transient strains which occur in a fraction of a second. A steady strain can be observed on an indicating instrument, using a 60-cycle excitation for the coils.

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Welded Ships May Be Better and Less Costly

Shipbuilders have in recent years been living through a succession of revolutions so that the traditional British calm of the Northeast Coast Institution of Engineers and Shipbuilders need have been little ruffled by the warning of an impending change of revolutionary character which N. M. Hunter imparted at its March meeting at Newcastle-on-Tyne. Electric welding, was Mr. Hunter's admonition, is about to reform almost all the basic ideas now held as to ship-fabricating methods.

Electric welding in shipbuilding offers strength combined with lightness, absence of all danger of leakages on account of riddling of the plating with innumerable holes to be filled later with rivets, and absence of calking, which is destructive to the solidity of the riveted overlap by the burring of the edge of the plate and the consequent hollow space caused between the two plates of a joint. This prizing up of one plate from the other tends to reduce the practical holding power of the joint.

Furthermore, as Mr. Hunter pointed out, not only has it been proved practicable to build an all-welded ship but some builders are prepared to quote an alternative and cheaper price for a ship built by that method. Such rapid progress has recently been made in the welding art that it appears possible to produce a structure by this means which is not only stronger than a riveted structure but also is 12.20 per cent lighter. The hull may also be lightened by elimination of connecting flanges, overlaps and rivet heads, and the panelwork of the machinery may be improved through the introduction of a light welded steel structure as rigid as the present comparatively heavy and clumsy cast-iron framework.

The British Corporation Register of Shipping and Aircraft has just issued provisional rules for electric arc-welding in ships and Lloyd's Register is reported to have concurred in this action.

EDITORIALS

L.W.W.MORROW
Editor

The industry doubly bereaved

ONE by one the honored elder statesmen of the electrical industry close the doors of their offices for the last time and pass from human sight. Last week Charles L. Edgar of Boston answered the call to lay aside the burdens of forty-five years of surpassing leadership, and before the day was over John B. Miller of Los Angeles followed him into the beyond. The Edison companies East and West mourn each the loss of a supreme commander and inspiring executive; the industry at large is deprived of two valued counselors, and the country of two great citizens.

From Rutgers College Mr. Edgar went to work for Thomas A. Edison, receiving from that association constructive influences which endured to the close of his life. Thus Mr. Edgar's electrical ancestry was most auspicious, but his success was due far more to his own manifold abilities than to the fortunate circumstances of his good start in business. Under his guidance the Boston Edison system grew from a small and rather dilapidated property serving 260 customers in eleven-hundredths of a square mile to a major property supplying about 400,000 consumers in an area 6,000 times as large. His pioneering courage, diligence, capacity to select able associates, humanitarian interest and sound judgment brought their reward in steadily increasing prosperity and broadening recognition of the quality of his leadership. National councils sought him out. Honor after honor came his way. He knew that the American public prefers first-class service at fair prices to cheap service at cut rates, and his plants and lines reflected this understanding. Upon him rested the ultimate responsibility for investing in many engineering advances, of which the most notable was the pioneer 1,200-pound steam installation at the station bearing his name. His was a first-order mind, but its swiftness and accuracy were not allowed to impair his unfailing courtesy to others. Beloved by his employees and friends, respected by the industry and highly regarded by the public, Charles Edgar found happiness in royal service to his time. His influence upon electrical history will remain a treasured possession.

Mr. Miller's career offers both a likeness to and a difference from that of Mr. Edgar. They were alike in their devotion to the electrical industry, in their boundless faith in its future, in the business ability and the ceaseless energy necessary to make their visions facts. Alike they won the devotion of their subordinates, the confidence of their colleagues and in abundant degree the support of their communities and their customers. Their careers were different in detail because of their contrasting environments. Mr. Miller dwelt and worked on the Western slope in a vast but homogeneous territory naturally suited to electrical development on ample geographical lines; Mr. Edgar's sphere was in an Eastern metropolis densely populated and highly industrialized but with well-delimited boundaries. Mr. Miller's chief preoccupation until very recent years was with water power; Mr. Edgar's was always with steam. Mr. Miller's lot lay in the still youthful land where the western course of empire is barred by the Pacific; Mr. Edgar's lay where the United States began, three hundred years ago, on the Atlantic. Figuratively speaking, they hailed each other across the continent, and there is a touch of drama in the simultaneous passing of these two men who for a generation have shone like electrical beacons, one against the Eastern and one against the Western sky of their common country.

New products at the N.E.L.A. convention

MANUFACTURERS in the electrical industry—along with everybody else—are in the throes of a lean market. No one is buying anything today where the purchase can be avoided or delayed. But, by this same token, there has never been a more eager desire among the power companies for ideas and new products that can be applied to reducing costs, improving the service or increasing the load upon the lines. As a result there is intense activity throughout the industry in product development. Old equipment is being redesigned. New ideas are being advanced to meet new needs. The manufacturers are making outstanding contributions to the progress of the art, and the exhibition at the coming N.E.L.A. convention will take on unusual interest and importance to the entire industry.

The actual value of this great display of electrical equipment, however, will depend upon two things—the skill with which exhibitors present these new ideas and products in their booths and the number of utility men responsible for operation and sales who attend this convention and study the exhibition. The committee in charge is wisely taking unusual measures to obtain both results.

There should be no false economy this year in restricting attendance at the convention. Its greatest value is to those engineers, commercial men and purchasing agents directly interested in equipment and appliances. For they operate the systems, build the load and spend the money for the industry. It is primarily for them that the convention is held, and for them the manufacturers provide this very costly educational exhibit. They should be there.

Results preferred to technique

A TELLING point in customer relations was made by L. F. Eaton of the Brockton Edison Company at a recent N.E.L.A. meeting in Boston when he asserted that the average user of electric water-heating equipment in the home cares nothing for the engineering and economic aspects of the service from the standpoint of the utility. An ample supply of hot water whenever he desires it and at a reasonable price sums up the customer's desires. In pioneering this service it is hard for power-company executives to realize that the interesting engineering phases of the problem literally have no meaning whatever for thousands of residential takers of energy, or that the incidence of costs as related to tank capacities, drawdowns, temperatures specified, wiring, metering, control of charging periods and relation of diversity to plant investment should be kept out of discussions leading up to sales of heating to the customer himself.

There is nothing to conceal if the customer is interested, but the less outward evidence of engineering analysis the better. Water-heating technique has its vital place in the development of this business, but more sales will be made and more customers satisfied if prices and service are expressed in the simplest possible terms.

Tell the story of regulation

WHAT should one expect to find in the annual report of a public utilities commission to the governor or the legislative assembly? The humble citizen taxed to support an institution set up to give him and the utilities and the whole commonwealth the benefits of social regulation ought to be able to learn about it from the board's annual report. He should find there an exposition of the philosophy of the tribunal as it has been evolved to meet the changing pattern of utility enterprise. He should find a chronicle of all the activities in formal proceedings, with the major ones at least embellished with interpretative material to show the whole why and wherefore of their prominence. If the commission devotes much of its continuous-session time to informal adjustment of the problems which come before it, they likewise should be recorded, so humanized as to contribute the Solomonic conclusions to the utility art for its broad guidance. If there is a staff of engineers, statisticians and accountants, what really are they so busy about all the time?

Contrast that sort of picture with one report just received at this office. There are nearly 600 pages devoted to tabulated data transcribed from the annual reports of the regulated companies—cold and forbidding, illuminating only on analy-

sis by the reader. Twenty pages list bus certificates. Sixty pages recite in conventional language the high points of the company reports, mere repetition in general. There is less than one page that gives any inkling of what the commission and its staff did or even thought.

"Regulation has broken down" is the cry. Regulation has never been built up, at least not in public appreciation. Smug complacency has apparently joined hands with timidity and reticence to keep from the people what they most need to know about regulation. Little wonder that political agitators and ambitious college professors instigate investigating commissions which aspire to put more teeth in the laws. Would any of this be necessary if the commissions should disclose the good they are continuously doing all around? At least, why should not a commission's annual report picture vividly what regulation has accomplished in terms of human values?

Isolated communities good market for refrigeration this year

BECAUSE of the very mild winter which has prevailed in most sections of the United States, it appears that the harvest of natural ice has been virtually nil. In communities large enough to support artificial-ice plants this situation will be of little consequence, but many small communities, and particularly farming districts in the north temperate zone, are dependent almost entirely on natural ice for refrigeration. Distribution of ice to the dwellers in these regions from artificial-ice plants in adjacent larger centers places a high price on the product.

In such territories there should consequently be a greater field for selling electric refrigeration than ever before. The household units required by farms are likely to be larger than those used in cities because they usually have more individuals to feed and because they must store more food on account of their distance from merchants. Besides, they frequently have to refrigerate or cool their own food products pending delivery to the market. Hence this year should be a very opportune time to convert the isolated populace which has formerly depended on natural ice to the electric idea not only for cooling and refrigeration but for other applications.

Advantages of electric ranges that need emphasis

ESSENTIAL factors that must be impressed on the public if electric ranges are to be sold to the extent aimed at by men in the electrical industry are brought out in the excellent article by Reese Mills printed in the ELECTRICAL WORLD of April 9 (page 663). In presenting the advantages and combating objections he outlines the approach that any aggressive sales program must follow. It may be necessary in the presence of some skeptics to present evidence not included in the article but which formed the basis for some of the author's assertions. This evidence is apparently available; it only needs collection for the use of every one engaged in promoting the use of the electric range.

Four advantages which are inherent in electric ranges might be emphasized above all others. One is the preservation of flavor and moisture in baked or roasted foods because the atmosphere inside the electric oven is not constantly changing as it does in a fuel-fired range. Another is the greater comfort of cooking on an electric range due to the better heat insulation of the oven and the fact that heated air is not constantly discharged from open burners and oven vents. Danger of asphyxiation when a gas flame is blown out or extinguished by the boiling over of a pot is one hazard that electric operation definitely avoids. Finally, the vitiation of the air that fuel-fired ranges cause has not been sufficiently stressed. The oxygen in a closed house is rapidly burned up by the process of combustion, particularly when several burners or an oven is lighted and the harmful effect is increased by the pollution of the de-oxygenized air with combustion gases. Many headaches are caused in this manner.

Backed by these advantages and by facts on the increased speed of electric ranges, the reduction in operating cost resulting from promotional rates, the possibility of buying on the installment basis ranges ready for service, their automatic control, reduced blackening of cooking utensils, elimination of matches and automatic lighters and avoidance of food shrinkage, and with appeals to pride of ownership, a salesman should be able to convince most housewives that they should spend something for their own comfort and convenience even if the family is crying for a new automobile.

Frank Dowd Comerford

WHEN, in 1927, Henry I. Harriman resigned the presidency of the New England Power Association to devote himself to civic affairs, the announcement that he had been succeeded by a Boston lawyer of 34 gave rise to much interested comment in conservative Eastern circles. Frank D. Comerford, the new president, was well known in the legal profession as a member of the prominent Boston firm of Ropes, Gray, Boyden & Perkins. He was, however, without either engineering or managerial experience, and there was naturally some wonderment in the utility industry as to how the new leadership would work out. It was soon seen that the Harriman mantle had fallen on strong shoulders. Three years after Mr Comerford took control the assets of the organization had more than trebled in value. The operating companies owned, controlled or supervised by the New England Power Association now distribute electricity and gas in 200 cities and towns, serving 500,000 customers and a total population of about 2,500,000. The expansion of the Power Association in the last few years is a striking story in which the acquisition of important properties at Worcester, Lowell, Lawrence, Quincy, Fall River and many other places has been paralleled by impressive engineering and construction developments culminating in the first Fifteen-Mile Falls plant on the upper Connecticut River and the inauguration of 220-kv. transmission from there into Massachusetts. The management of the many properties forming the Massachusetts Utilities Associates group was also added and the headquarters of the operating system transferred to Boston.

Mr. Comerford is a New Englander to the core. He was born at Worcester in 1893 and received his early schooling in his home city. He was graduated from Holy Cross College in 1914 and three years later received an LL.B. from the Harvard Law School. His law practice brought him into intimate contact with public utility affairs for ten years as the right-hand man of Archibald R. Graustein, another member of the law firm named above and a recognized expert in utility law. Mr. Comerford's knack of cutting through legal verbiage and technicalities and finding the heart of every problem without loss of time impressed business leaders who were clients of his firm. To sustained industry he adds a personality in which modesty and reasonableness are effective aids to success. He realizes the value of competent organization and at once discovered how to utilize the services of the able and loyal staff which twenty years of New England Power Company development under many vicissitudes had created.

Mr. Comerford is a vice-president of the International Hydro-Electric System and the International Paper & Power Company, president of the Narragansett Electric Company of Providence, the Connecticut River Conservation Company and the Rhode Island Public Service Company, and chairman of the board, Worcester Electric Light Company.

Insull Difficulties Clearing

Appointment of receivers for Middle West Utilities culminates situation long in the making. Commonwealth Edison, People's Gas Light & Coke and Public Service of Northern Illinois weathered the storm well. Various factors, including the illusory "new era," contributed to the ultimate breakdown.

THE largest receivership in the history of American business, that of the $2,500,000,000 Middle West Utilities System, was made effective last week by the appointment of receivers for the Middle West Utilities Company. The receivers named by Federal Judge Walter C. Lindley in the United States District Court were Samuel Insull, chairman of the company; Edward N. Hurley and Charles A. McCulloch, also of Chicago, who are known widely as business men and civic leaders. The move was a friendly action brought on behalf of the Lincoln Printing Company, of which Martin Insull, president of Middle West, is a large stockholder.

The board of directors of Middle West authorized the following statement:

"The action seemed unavoidable as the first step toward reorganization of the company. The action in no way affects utility operating companies which are subsidiaries of Middle West Utilities Company. These subsidiaries, whose business generally is eminently satisfactory in view of economic conditions, will function as usual, financing themselves as heretofore.

"The board emphasizes the fact that the Eastern properties of the company, which are not included in the National Electric Power group, are not involved in the receivership. Middle West Utilities Company does not owe money to any of its Eastern companies.

"The receivership is the result of the company's inability to finance its obligations. Economic conditions make it impossible to work out an immediate plan for the payment of about $22,000,000 in well-secured bank loans, slightly over $7,000,000 in partly secured loans and meeting of a maturity of $10,000,000 notes on June 1.

"With the company's assets conserved through protection of the federal court, reorganization plans for the company will be developed as rapidly as economic conditions permit. Details of the plan will be announced as they become available."

The nominal value of Middle West properties is in excess of $2,500,000,000. The system has a funded debt of more than $600,000,000.

The funded debt of the parent company amounts to $40,000,000, representing serial gold notes maturing annually in $10,000,000 installments from June 1, 1932, to June 1, 1935. In addition it has bank loans outstanding of approximately $27,000,000. The receivership bill sets forth that $24,000,000 of the notes are demand loans. The collateral securing these loans is not sufficient to cover the total at present market values, it was asserted.

Securities outstanding against the company and subsidiaries at the close of last year were carried on the books of the company at $1,249,546,522.

"Big Three" properties of Insull not directly affected

"With deep concern for the large number of holders of the securities of three of America's soundest utility companies," Mr. Insull said on Friday, "I have watched the drastic sacrifice in values of the securities of these companies—Commonwealth Edison Company, the People's Gas Light & Coke Company and the Public Service Company of Northern Illinois.

"Whatever may happen in the affairs of the other companies will have absolutely no effect intrinsically upon the standing of the three operating companies which serve Chicago and the surrounding area.

Commonwealth Edison's position

"Let us consider first the Commonwealth Edison Company. It is, perhaps, the largest steam-generating company in the country and has an unbroken dividend record extending over 42 years. This company itself has absolutely nothing invested in the securities of Middle West Utilities Company, Insull Utility Investments, Inc., or Corporation Securities Company.

"Commonwealth Edison Company has a wholly owned subsidiary — Commonwealth Subsidiary Corporation — which has total investments of about $113,000,000, and of this total investment just a little over one-tenth of 1 per cent is invested in securities of the two investment companies named. It holds no Middle West Utilities Company securities.

"Now consider these figures. Commonwealth Edison Company and its subsidiary of the present time have in excess of $20,000,000 in cash and no bank loans.

"Commonwealth Edison Company's net earnings for the first quarter of this year were more than $5,129,000, or only $98,000 less than for the similar period in 1931. In 1931, it will be recalled, the company earned its dividend of $2 a share by a very substantial margin.

"The People's Gas Light & Coke Company has absolutely nothing invested in the securities of the two named investment companies or Middle West Utilities Company. The company and its subsidiaries have more than $8,000,000 in cash and none of them has any bank loans.

"People's Gas Subsidiary Corporation has total investments of approximately $46,700,000 and less than 3½ per cent of this total is invested in the securities of the two investment companies named and Middle West Utilities Company combined.

People's Gas in sound position

"The earnings of the People's Gas Light & Coke Company to date, despite a rate reduction made last October, were but very slightly below those for the same period last year. The net earnings for the first quarter of 1932 were $1,692,000, or about $80,000 less than in the

first quarter of 1931. In 1931 the dividend of $8 a share was earned by a substantial margin. The company has paid dividends for a period of some thirty years with the exception of the post-war adjustment years.

"Public Service Company of Northern Illinois is in the same investment position as the two other operating companies. Not one cent of its money is in the securities of the two investment companies named or Middle West Utilities Company. The company and its wholly owned subsidiary—Public Service Subsidiary Corporation—has upward of $7,000,000 in cash, and neither company has any bank loans. The subsidiary corporation has $38,000,000 in investments. Of this total a little more than two-tenths of 1 per cent is in securities of the investment companies named and Middle West Utilities Company combined.

"The net earnings of Public Service Company of Northern Illinois have to date been in excess of those for the same period of 1931. The 1931 earnings, it may be recalled, were the largest in the company's history and amply covered its dividend. The net earnings for the first quarter of 1932 were more than $2,423,000, or $382,000 in excess of the 1931 showing.

"Commonwealth Edison Company has an issue of $20,000,000 of 3½ per cent notes due July 30. The People's Gas Light & Coke Company has an issue of $15,000,000 of 3½ per cent notes due the same day. Public Service Company of Northern Illinois has $15,000,000 of 4 per cent notes maturing July 30 and $10,000,000 debentures maturing August 1. It also has other obligations totaling $2,292,000 maturing during the year.

"The figures given represent all the maturing funded obligations of all these companies. None of the subsidiaries has any funded obligations maturing this year.

"In view of the splendid condition of these three companies and keeping in mind their record of credit standing, as well as their tremendous assets and earning power, it seems inconceivable that their obligations will not be met when due. While actual arrangements for payment have not been made, and it certainly would be unusual practice to make such arrangements for maturities over

Balance Sheet Middle West Utilities Company as of December 31, 1931

ASSETS

Cash		$2,626,850.75
Notes and accounts receivable — partly secured		1,354,387.86
Deferred payment sales of properties		1,743,523.29
Interest and dividends receivable		2,081,509.49
Prepaid expenses		281,405.99
Unamortized debt discount and expense		967,081.67
Uncompleted developments and projects		862,404.92
Advances to subsidiary companies		25,176,098.11
Securities borrowed from subsidiary company, at market value, per contra — pledged		574,400.00
Collateral securities, at market value, per contra —		
Pledged	$248,004.00	
Loaned to subsidiary company	125,000.00	
		373,004.00
Investments:		
Being stocks of subsidiary companies and other investments —		
Pledged	$85,588,702.43	
Unpledged	170,037,010.14	
Loaned:		
To subsidiary companies — Partly secured	$9,446,441.61	
To others — partly secured	6,924,056.37	
	$16,370,497.98	
Less: Reserve against loaned securities	5,000,000.00	
	11,370,497.98	
		266,996,210.55
Company's own securities:		
1,027 shares $6 convertible preferred stock, series "A," at market value, December 31, 1931	$39,282.75	
223,464-144/400 shares common stock, at $5 per share	1,117,321.80	
		1,156,604.55
Of the above there are —		
Pledged	$1,022,448.75	
Unpledged	843.30	
Loaned:		
To subsidiary companies	$125,812.50	
To others	7,500.00	
	133,312.50	
	$1,156,604.55	

In addition to the above there are in the subsidiary companies, 314,317-87/400 shares of common stock and 6,205 shares of $6 convertible preferred stock, series "A," of Middle West Utilities Company which have been revalued at December 31, 1931, $5 per share for the common stock and market for the $6 convertible preferred stock, series "A."

	$304,193,481.18

LIABILITIES

Notes Payable:		
Bank loans — secured	$21,961,600.00	
Others — partly secured	7,088,177.90	
		$29,049,777.90
Accounts payable — partly secured		1,855,245.05
Taxes accrued		36,632.24
Interest accrued		203,966.23
Dividend accrued — $6 convertible preferred stock, series "A"		454,776.75
Advances from subsidiary companies		1,327,566.22
Deferred payments on purchases of properties and securities		4,972,028.33
Liability to deliver borrowed securities, at market value, per contra		574,400.00
Liability to deliver collateral securities, at market value, per contra		373,004.00
Prior lien and preferred stock called for redemption (balance)		12,140.62
Reserve for syndicate losses		1,201,294.24
5 per cent serial convertible gold notes, due serially, June 1, 1932-1935		40,000,000.00
Capital Stock:		
Authorized —		
Cumulative prior preferred stock: 950,000 shares without par value, issuable in series.		
Cumulative Preferred Stock: 1,350,000 shares without par value, issuable in series.		
Common Stock: 25,000,000 shares without par value.		
Issued —		
Cumulative preferred stock $6 convertible, series "A"; Liquidation value $100 per share, 607,396 shares		60,771,445.94
Common Stock: 15,641,983 shares, stated value $10 per share		156,419,830.00
Common Stock Scrip Unconverted: 63,016-174/400 shares, stated value $10 per share		630,164.36
Surplus		6,311,209.30
		$304,193,481.18

Contingent liability as indorser on note payable of subsidiary company, $5,000,000.

Here is the start of the present avalanche of Insull securities. Middle West, with immediately payable and shortly maturing obligations of approximately $80,000,000, could not stand the strain and broke under it. The probability that cash for the more immediate of these obligations would be difficult or impossible to find in this present financial market precipitated a liquidation of not only Middle West but of all Insull securities, with the result that operating companies whose financial status could not be reasonably questioned were drawn into the maelstrom.

three months away, I have ascertained the views of investment bankers of this community who are conversant with the affairs of the companies, and I find the consensus to be that under prevailing conditions the refunding of these obligations could readily be effected."

Other receivers appointed

Judge Lindley appointed also receivers for the United Public Service Company of New Jersey, the United Public Utilities Company and the Southern United Gas Company. The last two named are subsidiaries of Middle West Utilities and their president is Martin J. Insull, also president of United Public Service. Samuel H. White was appointed receiver of the latter company. His bond was fixed at $100,000 also.

Receivers were later appointed for Insull's two big investment trusts, Insull Utility Investments, Inc., and the Corporation Securities Company of Chicago, as well as for the Mississippi Valley Utilities Investment Company, a smaller unit. These three investment companies have total investments of some $500,000,000. Their security holdings were obtained at high market prices, however, and are today worth small fractions of their purchase price.

The story behind the crash

What is the story of the financial difficulties of the Insull group of utilities? Many rumors and comments have been heard inside and outside the industry in connection with negotiations culminating in the Middle West receivership. The background of the situation is as follows:

Samuel Insull and his associates built up a very large group of utility properties. They are notable as operators and managers and their success with utilities drew to Mr. Insull an investment following in this country and in Europe of great magnitude. The financial policy of Mr. Insull was to invest money in utilities, capitalize this investment and make rates to the public that paid reasonable returns on the investment with due allowance for the maintenance and depreciation of the properties. He does not believe in building up large cash surplus funds because he believes this idle money to be unnecessary in a regulated industry where rates should reflect current costs. This principle of finance gives both to the public and to the investors the maximum returns at minimum cost.

In building utility enterprises Mr. Insull used several management holding companies to expand his holdings in certain areas and to consolidate and make more economical individual properties. A very rapid expansion was had in his holdings during what might be called the consolidation era of the industry. Financial and operating success accompanied this expansion until the present abnormal times.

This expansion occurred in the bull market era. In 1923 and 1924 all securities began to advance in value, most notably Middle West Utilities. At this time Mr. Insull stated publicly that the affairs of the companies did not appear to him to warrant these rather sensational prices but, after a temporary halt, the securities moved upward to new levels and the buying public distorted his statement and purpose by saying he desired to buy his own securities advantageously. Naturally Mr. Insull made no more public statements and the price of the securities of his properties as well as all others advanced by leaps and bounds. For example, Middle West Utilities in 1924 advanced from 43 to 92; in 1925 it reached 120, in 1926 it went to 134, in 1928 the top was 184 and in 1929, with the announcement of a ten for one stock split, the price went to $570 a share.

During this period of expansion and amid the general gospel of the "new era" Mr. Insull adopted the new forms of finance such as splits of stocks, the payment of stock dividends and a widened use of stock rights.

In this period, especially in 1929 and early 1930, also outside investors were attracted by his utilities and such groups as the Cyrus Eaton, the Chicago Corporation and the Sun Life Assurance Company bought heavily into Insull properties. In order to protect his holdings and consolidate his control with the object of continuing a management that had soundly demonstrated its capacity Mr. Insull formed two investment trusts, Insull Utility Investments, Inc., and later Corporation Securities.

The formation of these investment trusts at the top of the bull market is the main cause of the disastrous financial difficulties of the Insulls. They, like most everybody else, did not visualize the fact that the market value of investments could shrink from a book value of $398,000,000 in 1929 and 1930 to a market value of $112,000,000 at the end of 1931 and drop to less than one-third of that in the first four months of 1932. In the formation of the trusts the Insull family turned in its personal holdings of securities in the Commonwealth Edison, People's Gas Light & Coke, Middle West Utilities, Public Service Company of Northern Illinois and other Insull properties in return for common stock in the investment trusts. These holdings were turned in at prices below the existing market at the time and the statements and actions of Mr. Insull at the time and subsequently show his sincerity of purpose and his conviction that the prices charged the investment trusts were fair.

The investment following of Mr. Insull purchased the investment trust securities in volume, and when the market broke undoubtedly the trusts tried to maintain the market price of the underlying securities and for a long time the Insull securities showed greater resistance to the declining trend of the market than almost any other stocks.

Then, early in 1930, Mr. Insull purchased the Eaton stock holdings and in order to pay for this stock and others then purchased it was necessary to borrow funds pledging stocks already held. All investment trusts have experienced the disastrous results of borrowing money by this method in a bear market. Add to this the wholehearted response of Mr. Insull to the appeal of President Hoover that business proceed as usual. A larger than normal system expansion program was carried out by Insull properties as a patriotic endeavor to bring back normal business and this necessitated spending money and more borrowing by holding companies by means of short-term notes, since it was not a time for financing by means of securities issues.

Then came the current low market with investment groups dumping their Insull holdings on the market, with inability to finance at reasonable rates and with bank credit tightened against loan renewals. Undoubtedly the Insull family tried to support the Insull securities to the utmost and to hold up market values, but the conditions were too severe and too general to prevent Insull securities dropping to the unprecedentedly low levels of the present market.

The underlying Insull properties are in splendid condition and are making normal earnings. They are sound and well-managed enterprises. Bank loans are relatively small and it is evident that they will be renewed until times are more favorable for financing. It may also come about that some underlying properties will be sold to other utilities in order to consolidate the resources of the group to better advantage.

The record of Mr. Insull and his associates is creditable. They know the utility business and rank at the top as executives and managers. They acted in good faith and supported their investment following to the extent of their personal financial resources. It can be hoped, not unreasonably in the long run, that the present financial difficulties will be overcome and the Insull management will continue to establish standards of proficiency in the utility business.

A Birdseye View of Market for Sunlamps

From an analysis in which an N.E.L.A. Commercial Section committee extensively discusses the method of approaching each field and selling each application. Included in the complete report are such information as brief facts about sunlight lamps, how the market is being developed, enlisting the aid of physicians, how to get a campaign started and material to help sell.

Residential

1. Present Homes—The residential market can easily absorb more than one fixture per home in a large percentage of homes. The great variety of fixtures available today is a tremendous aid in reaching this market. Portable sunlamps are being used in living rooms and bedrooms. Ceiling fixtures are being installed in bathrooms, children's nurseries, kitchens, and basement recreation rooms.

2. New Homes—Speculative builders, architects, and owners can be sold on the installation of ceiling or wall fixtures in new homes in some or all of the places in which these lamps are being used in present homes.

Commercial—The advertising and publicity value of a sunlamp installation in attracting additional patrons has already led to a variety of installations in the commercial field. Among these prospects are:

- Apartment houses
- Barber shops
- Beauty parlors
- Bowling alleys
- Dance halls
- Gymnasiums
- Hotels
- Poolrooms
- Private clubs
- Restaurants
- Soda fountains
- Steamships
- Stores
- Swimming pools

Health—These prospects include:

- Churches and Sunday schools
- Clinics
- Doctors' and dentists' offices and waiting rooms
- Hospitals
- Kennels
- Offices and factories
- Penal institutions
- Pet shops
- Sanitariums
- Schools
- Veterinary hospitals
- Zoos

Rural—Here are some potential applications of sunlamps in the rural market:

- Chicken farms
  - Brooder houses
  - Laying houses
- Duck farms
- Horse stables
- Milch cow and calf stables
- Pheasant farms
- Piggeries
- Rabbit hutches
- Turkey farms

Steel Concrete Poles Used on Savoy Line

Combination reinforced-concrete and structural-steel poles are used on a 20-mile, 9,000-kva., 42-kv. (70-kv. ultimate) line in Savoy, France. The concrete portion of the pole is cast upright with wooden forms and the steel section is bolted to six ties extending from the top of the concrete. The standard poles, which are 32 ft. high, are built for 350-ft. spans. Two circuits can be accommodated by substitution of a steel extension that will support two more crossarms, René P. Chauvet, Morges, Switzerland, points out.

Standard tower with double insulators for telephone-line crossing

Special design for three circuits

One circuit is 5,000 volts, one 42,000 volts and the one on suspension insulators shows construction when 70-kv. operation is adopted.

Steel towers are used at angles of more than 2 deg. Of the 54 used eight are for angles of more than 70 deg. Pin-type, double-petticoat glass insulators are used, except at angles, where strain-type glass insulators are employed. The first mile of line is built for three circuits—one 5,000 volt and two 42,000/70,000 volt.

The cost of the line as given by Mr. Chauvet is shown in the accompanying table.

Itemized Cost of 20 Miles of 42-Kv. Line in Savoy

Concrete part of poles	$5,870	Erecting steel towers	910
Steel part of poles	2,582	Erecting steel parts of poles	346
Steel towers	7,580	Painting of towers and poles	620
Concrete foundations for steel towers	7,125	Switching station	4,160
Ground plates for steel towers	122	Surveying	2,322
Copper conductors	17,000	Local supervision	1,050
Tie wire	144	Line material	372
Pin type insulators (glass)	2,320	Right-of-way, damages	4,633
Strain insulators (glass)	1,860	Overhead expenses	1,730
Erecting conductors	732	Total expenses	$61,488
		Cost per mile	$3,074.40

Analyzing System Disturbances wi

By GEORGE A. POWELL
New York Power & Light Company

TO FACILITATE the analysis of system disturbances, particularly as to relay operations, causes of disturbances and their effects on system stability, a six-element electromagnetic automatic oscillograph was put in service at the Rotterdam substation of the New York Power & Light Corporation on May 29, 1931. It has been in service continuously since its installation. This period covered most of the 1931 lightning season. For the first time the following accurate information was obtained on disturbances on the 110-kv. and 66-kv. systems:

1. Length of disturbance.
2. Time required for relay and switch operations.
3. Amount of short-circuit current.
4. Amount of current in neutral of transformer bank.
5. Minimum values of voltages.
6. Phases involved.
7. Any tendency for instability.
8. Blowing out and restriking of arcs.
9. Check on patrol findings so that flashovers can be definitely connected to a particular disturbance.

Since the oscillograph was put into service the counters have recorded 94 automatic operations. The failure of oil switches to open all three phases simultaneously caused seventeen operations, disturbances on interconnected systems caused at least seventeen operations and fifteen other operations were of undetermined origin. These fifteen may have been caused by disturbances or switching on interconnected systems. By increasing the setting of the overcurrent starting relay the number of operations caused by switching and by disturbances on interconnected systems were materially reduced without reducing the operations due to trouble on the New York Power & Light system. The remaining 45 operations were caused by trouble on this system. These 45 operations gave 40 interesting and clear records. Two of the five poor records were the result of a burned-out lamp in the oscillograph and the three others were light struck when the film holder was opened by mistake.

The 40 records showed the following interesting facts:

	Number
Faults involving one circuit:	
Single phase to ground	17
Two phase to ground	7
Three-phase short circuit	2
Faults involving both circuits on a double-circuit tower line:	
Single phase to ground	3
Two phase to ground	5
Three-phase short circuit	6
Total	40
Arc carried into other phases	4
Arc went out while the circuit remained alive	4
Arc restruck	1
Tendency toward instability	2

The number of faults involving both circuits of a double-circuit tower line was rather discouraging, but the records indicated that possibly three of the fourteen might have been confined to one circuit if faster relaying and switching had been available. The records of these three faults indicate that after about 50 cycles the arc carried over into another phase, but whether this was on the same circuit or on the one on the opposite side of the tower could not be definitely determined. More interesting data on this point should be available when next year's records are compared with this year's, as the 110-kv. system is now being provided with high-speed switching and relaying.

Probably the most surprising fact in the preceding summary is the number of arcs that went out before all of the switches on the faulty circuit had tripped. In one case, after the arc had gone out and the system returned to normal with the circuit still alive, the arc apparently restruck and was cleared by the tripping of the last switch on the circuit. On only one of the four records did the arc go out in less than a second, and in this one case (Fig. 2) there was a phase-to-ground fault on the same phase of both circuits of a double-circuit tower line and only one of the arcs went out.

Although records have been obtained of a number of very severe disturbances caused by simultaneous faults on two circuits, there

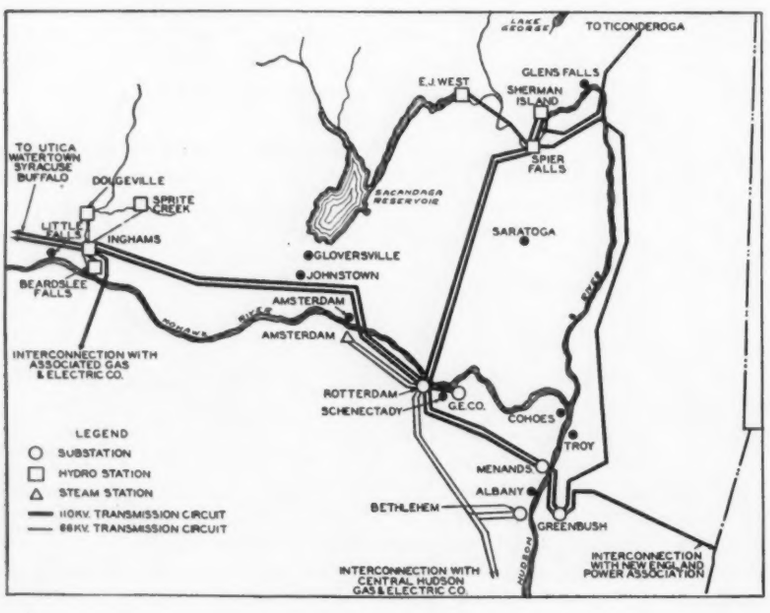


Fig. 1—110-kv. and 66-kv. system on which automatic oscillograph is used

with Automatic Oscillograph

have been only two records that showed the slightest tendency for the system to become unstable. Only a small amount of swinging was shown on these two records, one of which was obtained when at least three circuits in different parts of the system were involved in trouble.

The records from the oscillograph give a great deal of information about each disturbance that had never before been available. New methods of analyzing disturbances had to be developed to make use of this additional information. Previously the only information available was the oil switches that tripped automatically, the approximate amount of voltage drop and the approximate length of the disturbance. Knowledge of the last two facts was obtained from curve-drawing meters with their inherent inaccuracies due to overswing of the pen and failure to ink properly when required to record wide variations within short intervals. Relay and oil switch operations were considered satisfactory if the oil switches on both ends of a circuit tripped automatically at the time of a

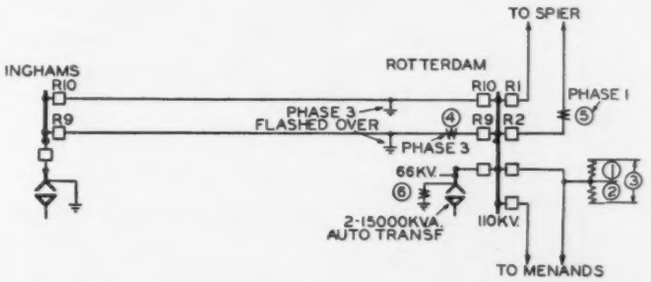
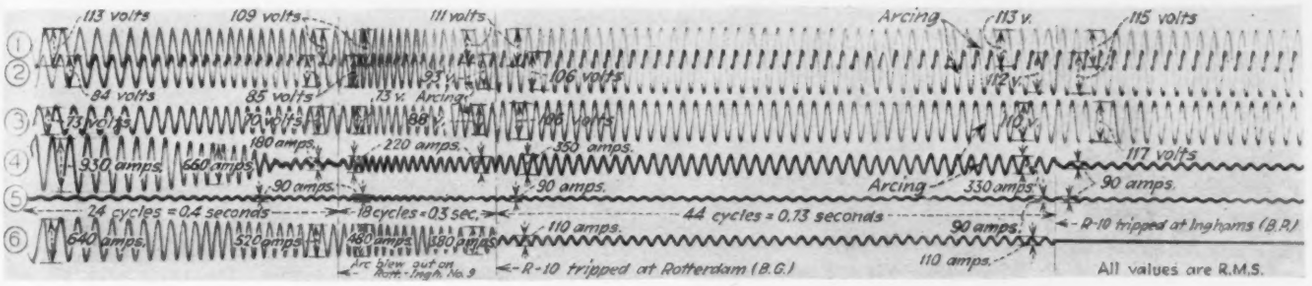


Fig. 2—Double-circuit flashover on tower line during lightning storm. Same phase arced to ground on each circuit. One arc blew itself out



Film No. 932 Time 4:7 P. M. Date 9/24/31

Switches Tripped			Patrols Found	Calculated G	Film Record							Relay Time Calculated (Cycles)	Sequence of Operations and How Indicated by Oscillograph
					Amperes			Volts			Cycles		
Station	Switch	Relay			⑥ G	⑤ R-2 Phase 1	④ R-9 Phase 3	③ 3–1	② 2–3	① 1–2			
Inghams	R-10	Balanced Power	1	700	640	90	930	73	84	113	18		2
Rotterdam	R-10	Balanced Ground			520	90	180	70	85	109	6		
					480	90	220	73	85	109	18		3
											42	15	
					110	90	350	106	106	111	44	30	4
											Total 86		

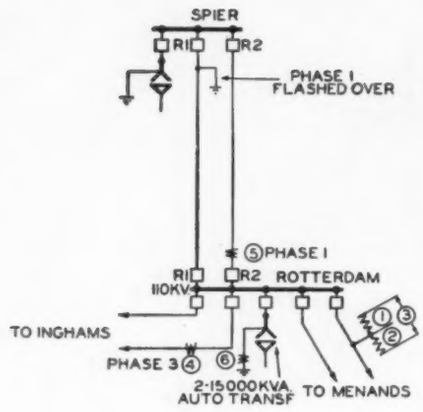
1. First patrols covered No. 10, but did not find anything. After receiving this film special patrols were sent out to cover both Inghams-Rotterdam No. 9 and No. 10. Calculations indicated that the fault was 9.4 miles from Rotterdam. The second patrol found about 10 miles from Rotterdam that the bottom phase (phase 3) of both circuits had flashed over.

2. The voltages indicate a ground on No. 3 phase and No. 3 phase of R-9 shows 930 amp., but R-9 did not trip. When the current decreases to 180 amp. in R-9 neither the voltages nor the current in the neutral of the banks change materially, indicating that the ground is still on the system. Apparently the arc on No. 3 phase of No. 9 blew out. (Note severe arcing.)

3. Eighteen cycles later R-10 tripped at Rotterdam on balanced ground. The ground current in neutral of Rotterdam banks decreased to 110 amp. The total over-all time for this balanced ground relay to operate is another indication that the fault was on both circuits for a few cycles.

4. R-10 tripped at Inghams on balanced power, the ground current ended.

Numbers in circles refer to elements of oscillograph. G—Ground current through Rotterdam banks.



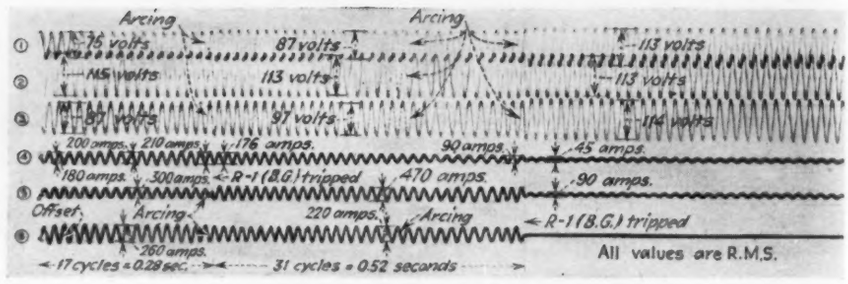


Fig. 3—Typical single-circuit flashover on tower line during lightning storm. One phase only arced to ground

Film No. 924 Time 11:22 P. M. Date 8/21/31

Switches Tripped			Patrols Found	Calculated G	Film Record							Relay Time Calculated (Cycles)	Sequence of Operations and How Indicated by Oscillograph
					Amperes			Volts			Cycles		
Station	Switch	Relay			⑥ G	⑤ R-2 Phase 1	④ R-9 Phase 3	③ 3-1	② 2-3	① 1-2			
Spier.....	R-1	Balanced Ground	1	280	260	300	200	87	115 Arcing	75	16 1	 15	2
Rotterdam	R-1	Balanced Ground											
					220	470	176	97	113 Arcing	87	16 4	15	3
					220	470	90	97	113	87	10		

1. Spier-Rotterdam No. 1 tower No. 60, No. 1 phase flashed over.

2. Voltage 2-3 is normal with No. 1 phase to ground. After 16 cycles there is evidence of arcing R-1 tripping on balanced ground at Spier.

3. The tripping of R-1 at Spier unbalanced the fault current at Rotterdam and the balanced ground relay operated in 16 cycles. There is evidence of arcing for 4 cycles when the R-1 oil switch at Rotterdam started to open, but when this arcing stopped there was no change in values. This oil switch did not open completely until 10 cycles later.

Numbers in circles refer to elements of oscillograph. G—Ground current through Rotterdam banks.

disturbance provided the disturbance did not last over two or three seconds. Circuits controlled by oil switches that had tripped automatically were always covered by special patrols as soon as possible after the trip-out. This practice has been continued since the oscillograph has been put into service and it is very gratifying to see how closely the patrol reports as to location and phase of insulator flashovers check with the oscillograph record. There had always been a question as to whether an insulator flashover located by the special patrol could be said to have occurred at the time of the trip-out.

Rotterdam was chosen as the location for the automatic oscillograph on account of its central location in the 110-kv. and 66-kv. systems (Fig. 1). There are four 66-kv. circuits and eight 110-kv. circuits from this station. All transformer banks connected to the 66-kv. and 110-kv. systems are "Y" connected with their neutrals solidly grounded. Most system disturbances involve one or more phases to ground, so it was decided to put the oscillograph into operation by current in the neutral of two 15,000-kva., 110-kv./66-kv. auto-transformer banks at Rotterdam.

The six galvanometer elements of the oscillograph may be used to measure either voltage or current. A three-phase watt galvanometer may be substituted for any two of these six, but it was decided to record only voltages and currents in the Rotterdam oscillograph. Three elements are used to record the three phase-to-phase voltages on the 110-kv. bus as it was thought best to get a complete record of either voltage or current, and with only six elements it was impossible to get the phase currents of all of the circuits. One element is used to record the neutral current in the auto-transformer banks, for this value is of particular interest in the analysis of ground-relay operations. This leaves only two elements of the oscillograph for recording phase currents. One of these elements is connected to the current transformer in phase 3 of one of the Inghams circuits and the other to the current transformer in phase 1 of one of the Spier Falls circuits. They are connected to different phases so that phase-to-ground faults will be more likely to produce a record on one element or the other even if they do not give as complete a record of the distribution of the current between the two stations.

Each oscillograph record of a disturbance was carefully analyzed. Most records could be divided into two or more sections, the dividing line between sections being the point where conditions—that is, the voltages or currents, or both—changed suddenly, due to an oil switch opening or the arc carrying into another phase. Within each section values of current and voltage are usually fairly constant. From the calibration film the values of each current and voltage are determined for each section and the values marked on the record. A form (as shown

under Figs. 2 and 3))was made for summarizing and analyzing each disturbance. It has columns for recording the values of each of the six curves within each of the sections and space for the analysis. Under the analysis conclusions are drawn covering the sequence of operations during each section and the reasons for the conclusions as indicated by the oscillogram. In addition the form has space provided for recording the switches that trip automatically, the relays that operate, what the special patrols found, the calculated value of the current in the neutral of the Rotterdam banks under the existing conditions for comparison with the current recorded on the oscillogram, and the calculated relay time for comparison with time shown on the record for the operation of relay and oil switch.

One of the most important features of the oscillograph record is the absolutely definite indication of the duration of the disturbance. Moreover, unless the disturbance involves more than one circuit, it is possible, by carefully analyzing the record, to determine which end of the circuit trips first and when it trips. This gives the number of cycles required for the operation of the relay and oil switch at each end of the circuit. By comparing this value with the calculated relay time faulty relay or oil switch operation can be detected.

Actual values of current and voltage as shown on the oscillogram are very useful. Calculations of neutral current in the Rotterdam banks can be readily checked for the various locations of grounds. Questionable or apparently faulty relay operations can sometimes be explained by consideration of the actual fault current. In one case of a fault involving both circuits of a double-circuit line one switch at Rotterdam did not trip and the arc blew itself out. When the film of the oscillograph was developed and analyzed it showed that after both ends of one circuit and one end of the other had tripped the current in the grounded phase had decreased so much that it was considerably less than the relay setting.

Another case where the current in the grounded phase was shown on the film was particularly interesting (Fig. 2). The special patrols failed to locate any trouble on the circuit, but with the actual current and voltage shown on the film calculations were made that indicated that the flashover occurred on the same phase of both circuits approximately 9.4 miles from Rotterdam. Patrols were sent out again to inspect carefully this section of both circuits, paying special attention to the phase that the film showed had flashed over. The flashovers were found approximately 10 miles from Rotterdam. Knowledge of the values of phase current and bank neutral current are very helpful in setting relays, particularly directional ground relays, which are connected to current transformers in bank neutrals. Knowledge of the actual value of voltage at times of disturbances will also be of considerable benefit in setting directional reactance relays now being installed on the 110-kv. system.

The oscillograph is a type PM-13-A1 manufactured by the General Electric Company. Except for a resistor box it is self-contained, with terminals projecting from its back for switchboard mounting. In addition to galvanometers, film holders and a driving motor, special equipment is provided for automatically putting the oscillograph in operation at times of disturbances. Although there are normally no parts in motion, it requires less than half a cycle to put the equipment into operation. An instantaneous overcurrent relay which operates in 1/20 of a cycle starts the motor and puts into motion a mirror arrangement in the optical system. While the driving motor and, in turn, the film are coming up to speed the record would be crowded (the waves not being extended), if it were not for the use of the mirror arrangement. By means of this arrangement the light beams are swept along the film in the direction opposite to its motion and at such a speed that they compensate for the lower speed of the motor. In this way a record is obtained with a fairly uniform time-

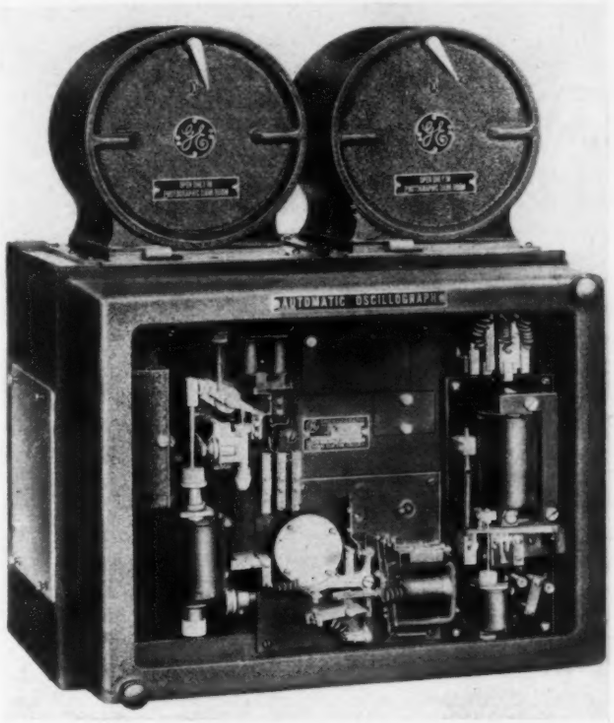


Fig. 4—Six-element type PM-13-A1 automatic oscillograph

scale throughout. A six-volt, 32-cp. automobile headlight lamp burning continuously furnishes the light. Power for this lamp and for the driving motor is furnished by a six-volt automobile storage battery with a tungar battery charger.

Two film holders, one for exposed and one for unexposed film, are mounted on top of the oscillograph. The film travels from one holder to the other at a rate of approximately 12 in. per second and may be set to operate for any desired period from two to twenty seconds. However, if the disturbance as indicated by the starting relay has not cleared at the end of the period the record will continue without a break for another period. The Rotterdam oscillograph was set to operate for approximately four seconds. The film is 4¼ in. wide and 200 ft. of it can be placed in one of the holders. An indicator on the outside of each holder shows the amount of exposed and unexposed film in each. In order to identify each record on the film with the proper disturbance an operation counter and an alarm for notifying the station operator whenever the oscillograph operates are provided. The oper-

ator can record the time of each operation together with the number on the counter so that the record on the film will be tied in with the proper disturbance. The holder containing the unexposed film may be removed at any time and an empty holder substituted. This permits prompt development of the film following a disturbance.

Although the records obtained at Rotterdam have been very helpful, one six-element oscillograph on a 110-kv. system cannot give a complete record of all disturbances. It will be desirable, as the system is extended, to install one or two others at key points. However, there have been two apparently practical suggestions made for making the automatic oscillograph give still more information. A few incomplete records have been obtained due to the fact that ground current did not always last throughout the entire disturbance. For this reason it is proposed to install a high-speed under-voltage relay in parallel with the overcurrent ground relay to start the oscillograph and also to prevent its stopping until the system voltages have returned to normal. The other suggestion is to provide an indication by offsetting the zero line of an element when one of the oil switches at the station where the oscillograph is located trips automatically. At least six switches could be shown in this way. The analysis of the record of a fault involving circuits from this station would be greatly simplified by such an indication.

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Safety Control Is Like Production Control

Out of a public utility payroll of $418,000,000 the direct cost of accidents in medical and compensation payments is $9,666,668. Indirectly the time lost by employees not injured, decreased production, delays, spoiled work, damage to property, training expense, loss of good will and morale raise this figure to five times as much—$38,666,672. The total accident cost in per cent of payroll is about 11 per cent, according to H. W. Heinrich, assistant superintendent Travelers Insurance Company, as told recently to the third annual Greater New York Safety Conference. Another way of estimating the total cost of utility accidents is to multiply the yearly compensation insurance items by three.

Control technique in the accident field is strikingly similar to the control of quality and volume of production. What works well in one field will also produce results in the other. Knowledge of the facts of each company's individual experience is essential. The unsafe practices of workmen which underlie the so-called "man-failure" accidents should be studied diligently as part of the major program of education, records, safety posters and literature, as commonly set up.

The claim records of the Travelers Insurance Company reveal the following as the outstanding items of unsafe practices and unsafe mechanical conditions:

Unsafe Practices—Electrical Work

1. Working on live high-tension conductors without adequate protection in the way of rubber gloves, etc.
2. Working on live conductors from above instead of below.
3. Working on improperly supported poles.
4. Standing too close and in improper place when poles are being set.
5. Working directly under men who are using solder.

Unsafe Mechanical Conditions

1. Portable and stationary electric power equipment not properly grounded.
2. Switches and other current-carrying parts not isolated or protected.
3. Safe clearances not provided between electric light and power wires, and telephone wires.
4. Shovel and hammer handles, chisels and other hand tools not kept in proper repair.
5. Handrails on elevated runways, platforms and stairs are not provided or, if installed, are not kept in good repair.
6. Spikes on pole pikes dulled.
7. Improper spacing of shoring timbers.
8. Machines not guarded.
9. Inadequate ventilation.
10. Inadequate artificial illumination of dangerous places.

A typical example of accident analysis in an individual public utility operation follows:

Unsafe Practices	Causes
1. Men engaged in raising poles guide the pole butts from in front instead of the side	Not instructed
2. Soldering done over the heads of men below	Disregard of instruction
3. Riding with other employees in trucks while wearing climbing spurs	Disregard of instruction
4. Riding on running boards and fenders of automobiles	Disregard of instruction
Unsafe Mechanical Conditions	
1. Electric cable, tools and equipment left lying in working space	Poor housekeeping
2. Inadequate testing facilities for linemen's rubber gloves	Poor planning

These particular practices and conditions had been responsible for the occurrence of 64 per cent of all the accidents during a period of two years. Concentration on the correction of them resulted in a reduction of accident frequency and cost of over 50 per cent in one year.

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Police Chief Emphasizes Protective Value of Light

Garrett J. Farrell, chief of police of Hartford, Conn., back in 1928 said: "Porch lights are great helps in preventing burglaries. In fact, houses where porch lights are burning in front and rear are almost never disturbed by sneak thieves and burglars. In the residential districts, where trees prevent the street lights from illuminating the yards, property owners can materially assist the police officers to keep unauthorized marauders off their property by the use of their porch lights."

This is no new thought, but if every utility could get the chief of police in each locality to express his attitude on the value of outdoor night lights and would publicize the statements, the public might be more extensively impressed with the protective value of light, thereby stimulating the domestic use of energy during off-peak hours. The Hartford Electric Light Company did this in an effective brochure distributed among customers. Its title was "Darkness and Danger Go Hand in Hand.—A light on your porch all night costs less than a postage stamp."

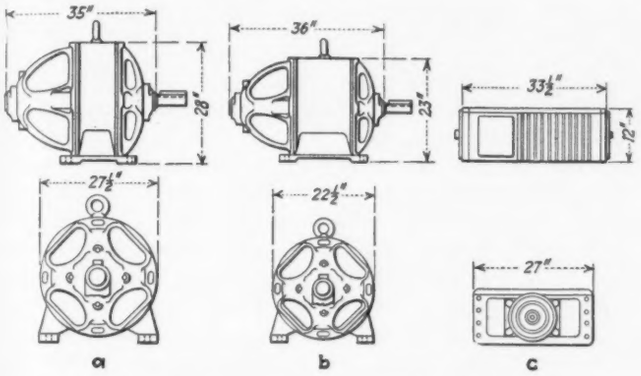
Mine Motor Almost Solid Iron and Copper

By P. E. HOCHSTETTER

Industrial Motor Engineering Department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

The smallest possible motor dimension for a required rating is necessary in practically all mine and vehicle applications. A new design of coal cutter motor shows how far this reduction in size may be carried. The principal limitation in the design was the height, which was not permitted to exceed 12 in. The other dimensions are 27 in. wide and 33½ in. long. It has a 50-hp. rating for one hour at 1,600 r.p.m., as well as 20 hp. continuously at 1,800 r.p.m.

It was designed for explosion-proof service in gassy mines. In comparison with a standard totally inclosed motor for regular industrial applications it occupies a smaller space, but the weight of the motor is nevertheless greater. This is necessary in order to reduce the losses in proportion to the smaller motor surface. As a result of this compactness and generosity of design almost every cubic inch of the motor is occupied by active material.



Eight horsepower per cubic foot

New rectangular coal cutting motor has less than two-thirds the volume of standard and long-core motors of the same 20-hp. continuous rating.
(a) Standard motor weighs 1,300 lb.
(b) Planer motor weighs 1,000 lb. A motor of these proportions 12 in. high, same as (c), would deliver only one-fourth as much power.
(c) Coal cutter motor weighs 1,600 lb.

The unusually small height of the motor made it necessary to use consequent pole construction whereby only one-half of the four main poles are equipped with field coils. These poles are placed on the sides where ample space is available, while the other two poles, being on top and bottom of the motor, have no coils whatever, and therefore can be very short. The four commutating poles are specially shaped in such a way that they fit into the remaining space.

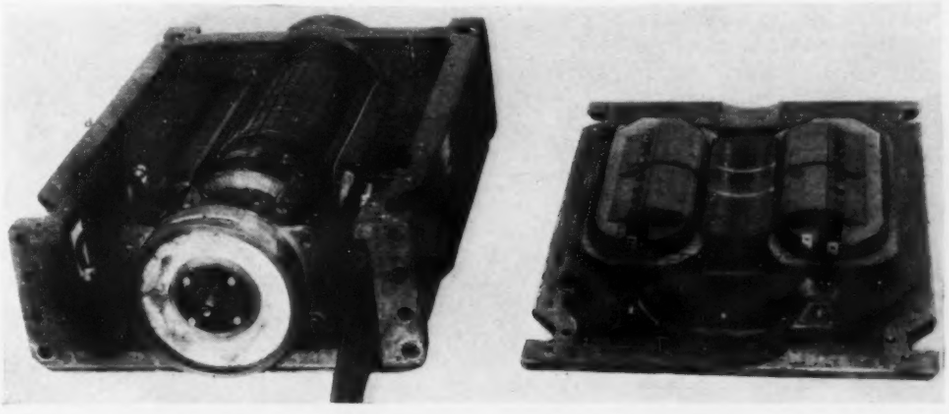
In spite of the extremely crowded design, the motor has a very high overload capacity, which is necessary in view of the severe service conditions. Tests have shown that the motor commutates successfully up to six times the continuous rating, while the starting current may go up as high as twelve times the continuous current without flashing over or damaging the commutator. These excellent characteristics assure low maintenance cost and long motor life.

A handhole on each side of the motor about 4x4 in. and covered in service by a steel plate allows inspection of the commutation and renewal of the carbon brushes. For closer inspection the top plate of the motor can be taken off entirely without even disconnecting the wiring between the motor field coils.

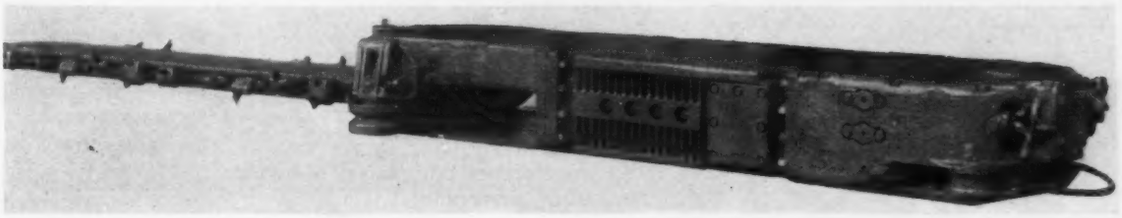
The fact that motors can be built with such a small height for the required power will open a number of other possibilities in the mining field wherever space is limited. With approximately the same motor shape the output will change with about the square of the height. In mines free from gas, where the explosion-proof construction is not necessary, such motors can be built with external ventilation which would increase the rating very materially, especially for continuous service.

Top plate removable

Ordinarily for inspection purposes the commutating poles and coils here shown bolted to the top plate would be left attached to the main body of the motor and the top plate alone removed.



Coal cutter driven by flat motor



Interference Responsibility Shared by Radio User

Los Angeles ordinance places due responsibility for poor radio reception directly upon complainant. All factors are capable of exact determination or measurement. Analysis shows causes of trouble and cost of investigation.

ONE of the greatest difficulties encountered by public utilities or other agencies in eliminating radio interference has been lack of any means of compelling the complainant to place his own house in order before charging some one else with the entire responsibility. In the city of Los Angeles, at least, this serious handicap in handling complaints has been overcome by a new radio interference ordinance that puts the complainant whose installation does not meet certain minimum requirements in the category of an offender along with the person responsible for the primary source of interference.

The ordinance is the culmination of several years of effort to have enacted an ordinance that would be fair to all parties concerned. An ordinance passed in 1929 was weak and unenforceable and so incapable of exact interpretation that, like most such ordinances, it was of little or no value.

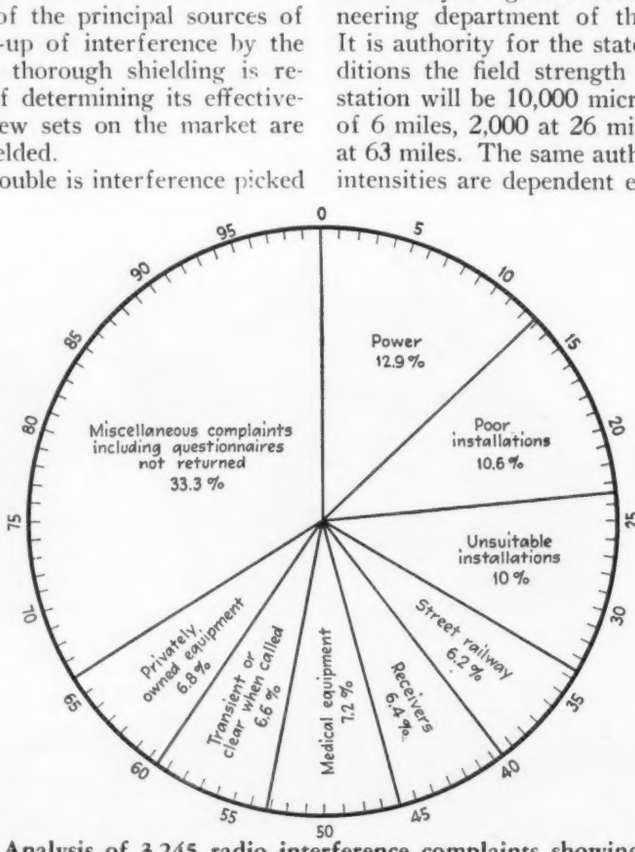
The new ordinance provides that the complainant's installation must meet certain reasonable requirements before he may demand that outside sources of interference be eliminated. One of the principal sources of poor reception is direct pick-up of interference by the set itself. To eliminate this thorough shielding is required and an exact means of determining its effectiveness is prescribed. Only a few sets on the market are now said to be effectively shielded.

Another major source of trouble is interference picked up on the antenna, and the ineffectiveness of the antenna itself. Requirement that the lead-in be shielded and that the aerial be at least 40 ft. in length and not less than 20 ft. above the ground insures that interference pick-up from house wiring appliances will be a minimum.

One of the most important features of the ordinance is specification of field intensity from broadcast stations. Many complaints have been utterly unreasonable in their demands for elimination of interference, but with specification of minimum field strength and an exact means of determination little room for argument is left on this score. The ordinance specifies that the field strength of a broadcast station being interfered with must be more than 500 microvolts per meter or greater, as measured on a field intensity or noise meter. This value of field strength was determined as reasonable after comprehensive field strength measurements had been taken at numerous points throughout the metropolitan Los Angeles area.

Some conception of what values of field strength mean may be gained from data compiled by the engineering department of the Department of Commerce. It is authority for the statement that under average conditions the field strength of a 1,000-watt broadcasting station will be 10,000 microvolts per meter at a distance of 6 miles, 2,000 at 26 miles, 1,000 at 41 miles and 500 at 63 miles. The same authority states that desirable field intensities are dependent entirely upon interference conditions, or noise level, and that in general an intensity of 500 microvolts per meter is desirable in rural districts, 2,000 in residential districts and 10,000 in business districts.

Field strength depends entirely upon the output of broadcasting stations and conditions that affect propagation and attenuation of radio waves. The value of 500 microvolts per meter was determined as proper for the city of Los Angeles, but might be too high or entirely too low for other communities. However, field strength is capable of exact measurement with instruments now on the market and suitable values may be chosen for any particular set of conditions or locality.



Analysis of 3,245 radio interference complaints showing distribution by percentage

Table I—Causes of Interference Cleared by Utilities

Bonding	97	Insufficient strain on insulator string	4
Hardware	37	Routine	3
Pole top switches	48	Transformer bushings	3
Broken insulators	39	Unsoldered service	2
Trees	23	Ground in ornamental light	2
Transformer cut-outs	22	Oil leaks	2
Connections	16	Broken poles	2
Voltage	13	Secondary grounding on transformer case	2
Transformers	13	Meter troubles	2
Fuseholders	14	Loose transformer terminal	1
Guy wires	12	Lightning arrester	1
Fuses	9	Transformer leaking oil	1
High-voltage signs	7	Overloaded transformers	1
Dirty insulator	4	Broken crossarm	1
Service wires in trees	1		
Unsoldered primary lug	1		
Primary neutral grounds	4		

Another important feature of the ordinance is that it affords redress for the complainant. If his installation complies with requirements, or is made to comply, and providing there is the specified field strength within a radius of 50 ft. from the receiver, then he has the police powers of the city to back up his demand that the offender eliminate the source of interference without delay.

Public utilities are exempt from provisions of the ordinance for the obvious reason that requirements governing their operation and their responsibility for radio interference are laid down by the state public service commission. Otherwise, there would be a conflict between state and municipal authority.

This introduces the subject of how the utilities are handling radio interference investigation. During the early years of radio the electric utilities undertook to investigate all interference complaints and remove the cause in so far as their own lines or equipment were involved. It was soon seen that this plan did not take care of a situation which grew rapidly in magnitude and became progressively worse, because there was no provision for locating and eliminating other sources of interference. Nor were radio dealers included, who were very vitally interested in good reception where sets sold by them were involvd.

Out of this situation of divided responsibility there was evolved the plan that has now been in operation for several years in the San Francisco Bay area and metropolitan Los Angeles. All utilities concerned and the dealers as represented by the Radio and Music Trades Association joined co-operatively in setting up a radio interference department of the association, the duty of which was to employ investigators, locate sources of interference and notify the responsible party. The expense of the work is prorated among the several parties concerned approximately as their interest or responsibility appears. Each utility when notified of a source of interference from its lines or equipment investigates and clears the trouble at its own expense.

The plan has worked out admirably and to the satisfaction of every one concerned and has been the means of forestalling unjust city ordinances or state legislation. It has proved conclusively that co-operation between public utilities and the radio industry is not only possible but profitable to both. Duplication of effort is avoided, unbiased decisions are rendered, public reaction to radio interference is stabilized and the cost of investigation is minimized. It is notable that under this plan not a single complaint of radio interference was received by the California Railroad Commission during 1931 from southern California.

Analysis of complaints

Records of the interference department of the Radio and Music Trades Association of Southern California should prove of interest and value. During the year 1931 there were a total of 3,245 complaints received and investigated. Of these, 2,007 were reported by listeners, 593 by dealers, 637 by utilities and eight were miscellaneous. It is interesting to note here that there is an estimated total of 700,000 radio receivers in the territory covered in the scope of the department's work. This means that there was less than one complaint for every

Los Angeles Ordinance Prohibiting Interference With the Reception of Radio Broadcast Signals

Section 1—The word "person" shall mean and include both the singular and plural and shall also mean and include, person, individual, firm, corporation, partnership, co-partnership, association, club, society or any other organization.

Section 2—It shall be unlawful for any person to operate or cause to be operated in the city of Los Angeles any device, appliance, equipment and/or apparatus which creates or causes high-frequency oscillations which interfere with the reception of radio broadcast signals providing:

First—That the radio receiver being interfered with complies with the provisions of Section 4 of this ordinance.

Second—That the installation of the radio receiver being interfered with complies with the provision of Section 5 of this ordinance.

Third—That the signal strength of any radio broadcast station being interfered with conforms to the provisions of Section 6 of this ordinance.

Section 3—It is expressly understood and provided, however, that this ordinance shall not apply to radio broadcast stations, either commercial or amateur, licensed by the federal government and/or which are engaged in interstate communication and/or public utilities which are under supervision of California State Railroad Commission.

Section 4—Any and/or all radio receivers coming within the provisions of this ordinance shall be thoroughly and effectively shielded. No receiver shall be considered "thoroughly and effectively" shielded which will deliver a 0.050-watt (50-milliwatts) output at any frequency within its tuning range when placed in a field intensity of 10,000 microvolts per meter without an antenna or ground and with the volume control at the point of greatest sensitivity.

Section 5—Any and/or all radio receivers coming within the provisions of this ordinance shall be supplied with and operated from a suitable antenna and ground system the minimum requirements of which shall be as follows: The antenna shall be not less than 40 ft. in length, in a straight line, suspended not less than 20 ft. from the ground at any point, and shall be placed as far as possible and practical from inductive relation with any other wires. The lead-in from the antenna to the receiver shall consist of a No. 14 Brown & Sharpe gage rubber-covered copper conductor, the rubber insulation being entirely surrounded by either a closely woven copper mesh or lead sheath to form a protective armor. This lead-in to extend in one continuous piece without breaks from the antenna proper to the antenna binding post of the receiver. The ground shall consist of either a water pipe or a ground rod connected to the ground post of the receiver and the metal protective armor.

Section 6—Any and/or all radio broadcast stations which deliver a modulated field strength of more than 500 microvolts per meter to any point within a radius of 50 ft. from the radio receiver being interfered with shall be considered as coming within the provisions of this ordinance.

All measurements of field strength shall be made with either a field strength meter or a noise meter so designed, constructed and calibrated that radio broadcast signals and/or radio interference can be collected on an antenna; the signals or interference so collected balanced against a standard noise generator and the relations between one and the other determined and read in terms of microvolts per meter.

Section 7—Any person violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor and, upon conviction thereof, shall be punishable by a fine of not more than $500.00, or by imprisonment in the city jail for a period of not more than six months, or by both such fine and imprisonment.

Important Provisions of Los Angeles Radio Interference Ordinance

Effective January 20, 1932

It shall be unlawful for any person to operate any device which creates or causes high-frequency oscillations that interfere with reception of radio broadcast signals providing that:

1. Receiver interfered with is thorqughly and effectively shielded.

2. Antenna is 40 ft. or greater in length and not less than 20 ft. above ground.

3. Antenna lead-in is shielded.

4. Field strength of broadcast station interfered with is not less than 500 microvolts per meter of antenna length as measured by a field strength meter.

The ordinance is a penal ordinance and is enforceable by the Police Department, with suitable penalty for violation.

200 receivers. A careful analysis of these 3,245 complaints showed major sources of trouble as indicated by the chart on page 738.

From 384 complaints sent to utilities for clearing the causes of trouble indicated in Table I were found.

Cost of operation

Cost of operation was as follows: Total office expenses of $2,942.20 were made up of the following items: Stationery and printing, $574.03; taxes, $5.63; office expense, $49.04; telephone and telegraph, $378.78; postage, $162.04; rent, $480; sundry, $391.58; furniture, $421.35; traveling expense, $157.16, and insurance, $267.47.

During this period a complete set of office furniture, including desks, chairs, carpet and typewriter, was purchased. Included also were three payments on a General Electric Noisemeter. These may be classified as unusual expenses that will not be duplicated. The stationery and printing bill is high, principally as a result of broadcasts over two local stations. This brought thousands of requests for antenna and ground specifications.

Total expenses were as follows:

Total labor cost	$11,240.00
Total office expense	2,942.20
Total extra office help	17.00
	$14,199.20
Unit labor cost per complaint	$3.47
Miscellaneous expense per complaint	0.91
Total unit cost per complaint	4.38

Sources of revenue for maintaining the work were as follows:

Southern California Edison Company	$5,040
Bureau of Power & Light (City of Los Angeles)	3,360
Los Angeles Gas & Electric Corporation	2,580
Radio and Music Trades Association	2,015
City of Pasadena municipal system	300
Los Angeles Railway Corporation	300
Pacific Electric Railway	300
Southern Sierras Power Company	300
Southern California Telephone Company	300
City of Bell	100
City of Claremont	20
Total	$14,615

The unit cost of $4.38 per complaint given above is approximately 1.7 cents per year per domestic meter in the case of the electric utilities, as against an estimated revenue from radio of $5.40 per meter per year. These figures apply to total domestic customers by taking into consideration the radio saturation of approximately 60 per cent that prevails in southern California.

▼ ▼ ▼

South and West Less Active

For nearly two years following 1929, industrial activity in the South continued at a rate that was nearly constant and at a level only moderately lower than that prevailing during that year of high industrial production. In that respect the South differed from the rest of the country. During the past few months there has been a recession which, judged on the basis of electrical energy consumption, amounted to 8 per cent in March compared with February.

The decline was particularly marked in iron and steel, where operations are only 40 per cent as active as in March, 1931. Similar, though less drastic, recessions are indicated in chemicals and rubber products. Textiles, on the contrary, are fully up to last year's level and activity in cement mills is reflected in the recently rising index of the stone, clay and glass group.

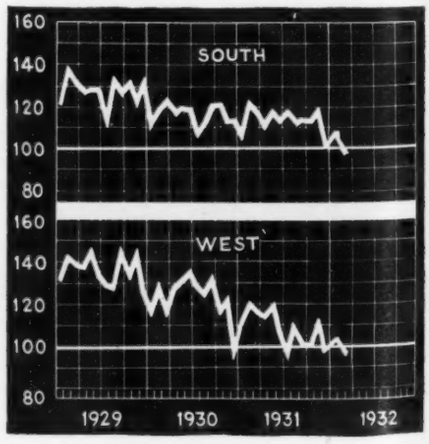
In the West the average change is similar to that in the South, the downward movement being marked in foods, metals, rubber and the stone-clay-glass group, while other lines are steady or show moderate gains.

Indices of Industrial Activity in South and West

Base: Average Month, 1923-1925 = 100

	South					West				
Industrial Groups	Mar., 1932	Feb., 1932	Jan., 1932	Dec., 1931	Mar., 1931	Mar., 1932	Feb., 1932	Jan., 1932	Dec., 1931	Mar., 1931
All industry	**96.1**	**104.1***	**106.0**	**100.0**	**117.5**	**95.9**	**103.7***	**104.0**	**98.3**	**115.7**
Chemicals	129.0	134.9	132.2	137.0	166.6	81.6	91.6*	92.0	88.3	71.8
Food	135.0	151.0*	154.9	151.9	154.0	115.5	127.0	129.0	134.4	148.4
Iron and steel	82.1	117.6*	145.2	117.0	202.8	.....	.....	.....	.....	.....
Metal working plants	60.6	68.8	64.1	68.5	80.4	.....	.....	.....	.....	.....
Metals Group	72.6	115.6	109.6	104.3	148.8	38.6	49.7*	45.3	32.7	64.1
Forest products	47.8	60.8	59.8	44.6	64.1	130.0	135.2	136.0	124.8	152.1
Paper and pulp	132.2	140.5*	124.8	96.6	142.0	132.3	121.4*	121.0	110.6	125.3
Rubber	71.5	93.0*	96.7	70.9	99.8	102.5	98.1	103.7	53.7	155.0
Shipbuilding	.....	.....	.....	.....	.....	88.0	87.4	96.7	87.8	88.7
Stone, clay and glass	126.9	94.7	106.7	113.1	136.6	77.5	80.8*	83.5	79.0	94.9
Textiles	96.2	107.0	97.4	102.8	95.8	.....	.....	.....	.....	.....

*Revision.



Electric Operations Below 1931 Level

SOME improvement, though a slight one, is indicated by February returns of electric light and power companies. Operations continue below last year's level, but the decrease in revenue was 3.9 per cent, against 4.5 per cent in January, and the decrease in energy output was 3.1 per cent, against 5.2 per cent. Operating and maintenance expenses are down by a larger percentage than revenue, the decline from 1931 being 6.1 per cent in February and 6.3 per cent in January, but the difference in dollars was not sufficient to offset the reduction in revenue.

Estimated revenue for the industry as a whole was $175,110,000; a year ago it was $182,280,000; corresponding operating expenses, not including interest, taxes, depreciation or sinking fund, were $71,190,000 and $75,820,000; the net, therefore, fell to $103,920,000, compared with $106,460,000 in February, 1931.

In the matter of energy production the most noteworthy feature is the much larger output from water power and consequently the smaller amount generated from fuels that has characterized operations during the past few months compared with the winter of 1930-1931. Relief from drought conditions made possible an increase of 36.7 per cent in hydroelectric output in February. This is an extraordinary change.

The reduction of 20.5 per cent in fuel-generated energy, with the attendant saving in fuel, no doubt accounts for a considerable portion of the cut in operating expenses. The inference is that employment has been maintained more nearly on the scale of former years than in a great many other industries.

Regionally New England shows the smallest decline, 1.5 per cent, in revenue compared with conditions a year ago. The central industrial area is down 5.6 per cent (against 7.6 per cent in January), the West about 6 per cent. In energy production the Middle Atlantic region is down 2.8 per cent, which is a decided improvement over January, while the South Atlantic and West North Central States report sizable increases. Other sections show losses of varying magnitude (see Table II). It is worth noting that revenues in the electric light and power industry remain, month by month, above the average of the past five years.

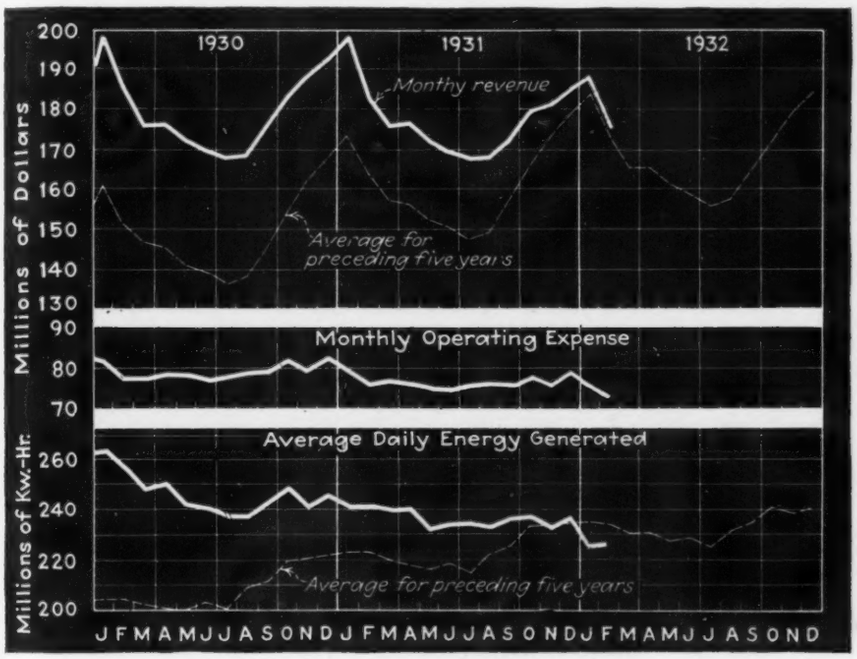


Table I—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1931	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
November	6,995,385	—3.2	1,963,631	—2.3	5,031,754	—3.5	1,951,000	+0.7
December	7,339,892	—3.5	2,574,861	+17.8	4,765,031	—12.0	1,957,000	—1.6
1932				a				
January	7,098,831	—5.2	2,928,805	+31.9	4,170,026	—20.9	1,985,000	+1.0
February	6,540,397	—3.1	2,797,858	+36.7	3,742,539	—20.5	1,874,000	+3.0

Table II—Regional Operations, Revenue, Energy Output, in February, 1932

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	175,110	—3.9	6,540,397	—3.1	2,797,858	+36.7	3,742,539	—20.5
New England	18,700	—1.5	449,379	—4.5	255,213	+116.5	194,166	—45.0
Middle Atlantic	47,340	—3.0	1,657,953	—2.8	531,117	+57.4	1,126,836	—17.7
East North Central	41,610	—5.6	1,531,433	—6.6	200,334	+77.2	1,331,099	—12.8
West North Central	14,520	—4.5	462,842	+5.8	166,310	+84.7	296,532	—14.7
South Atlantic	18,630	—2.7	837,457	+8.7	547,158	+55.0	290,299	—30.3
East South Central	5,870	—5.1	285,430	—8.2	241,156	—8.3	44,274	—7.4
West South Central	9,470	—6.0	318,806	—6.0	29,760	+360.0	289,046	—13.2
Mountain	4,160	—6.1	204,166	—9.5	151,832	—7.3	52,334	—15.1
Pacific	14,810	—3.5	792,931	—6.7	674,978	+12.2	117,953	—52.5

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations.

Table III—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*		Total Operating and Maintenance Expense†	
	1931 Thousands	Per Cent Inc.	1931 Thousands	Per Cent Inc.
Nov.	$180,610	—3.6	$75,270	—4.5
Dec.	184,870	—3.7	79,510	—2.9
1932				
Jan.	188,010	—4.5	73,940	—6.3
Feb.	175,110	—3.9	71,190	—6.1

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.

†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions.

Industrial Plant Power Factor Raised 29 per Cent

By MAX KUSHLAN

Reduced bills pay for corrective motors. Motor types analyzed in plant development.

IN MAKING shoe soles variable power demands are imposed by the mixing and grinding machinery upon the driving motors in starting and by mechanical obstructions associated with processing. At the plant of the Avon (Mass.) Sole Company in 1929 there was a total connected load of 975 hp. in induction motors and 25 kw. in lighting and heating service. This type of motor met the need for heavy starting torques and stability at reasonable overloads, but it resulted in the low power factor of 62 per cent during periods of maximum demand, with objectionable heating of leads and equipment, a general lowering of plant efficiency and correspondingly higher power bills. Growth of business required the addition of two new mixers, a cracker and a mill at that time, calling for 325 hp. in motors. Induction, synchronous and Fynn-Weichsel type motors were considered and the power factor was brought up to 91 per cent by the installation of four of the last-named machines, following a study of the relative value of each type for the service proposed. The new motor installation, it was found, would pay for itself in reduced demand charges in 31 months, and the purchase was made on this showing.

Electrical energy is supplied the plant by the Edison Electric Illuminating Company of Brockton on a demand charge plus energy rate, the latter being on a sliding scale, varying in proportion to the monthly kilowatt-hour consumption. A discount is applied to all energy taken in excess of 150 hours' consumption per month of the maximum kilowatt demand. The demand charge is based on the maximum kilovolt-amperes recorded at fifteen-minute intervals. The effect of power-factor variations on monthly demand charge in this plant, based on a maximum of 480 kw., is shown on page 743 for a range of from 50 to 100 per cent. With 60 per cent power factor the monthly demand charge is $746.25, and at 90 per cent this is reduced to $505.95. Further benefits accrue from increased efficiency of motor performance. Additional machines and driving requirements were:

No.	Hp.	
1	100	for a No. 3A Banbury mixer, 600 r.p.m.
2	50	for a 16-in. x 42-in. cracker, chain drive to 90 r.p.m.
3	75	for an 18 x 50-in. mill, chain drive to 90 r.p.m.
4	100	for a No. 3A Banbury mixer, 600 r.p.m.

All motors 550 volts.

With induction motors of the wound-rotor type of the required ratings, the computed performance at 60 per cent of full load is as follows:

Full Load Rating Hp.	Kw. Demand	Kva. Demand	Reactive Kva. (Lagging)
50	25.3	41.1	32.2
75	37.2	58.5	45.2
100	50.5	79.0	60.7
100	50.5	79.0	60.7
325	163.5	257.6	198.8

With an assumed diversity of 60 per cent for the new machines, the additional load corresponds to an increase of 163.5 kw. in monthly demand when using wound-rotor induction motors. The existing average demand of 320 kw. gave a reactive kva. of 402.8 with a power factor of 62.2 per cent (320 x 1.2587 [the tangent of the phase angle] = 402.8). The total reactive kva. with the additional motors of the slip-ring type equaled 198.8 + 402.8, or 601.6. The total kilowatt demand with a 60 per cent diversity factor equaled 320 + 163.5, or 483.5. This corresponded to a demand power factor of 62.6 per cent.

To raise the demand power factor to 85 per cent it was found necessary to produce the following reactive effect, computed as follows:

Power-Factor, Per Cent	Tangent × Kw. Demand	Reactive Kva.
62.2	1.2587 × 320 =	402.8
85	0.621 × 483.5 =	300.2
Correction required		102.6 (leading)

It appeared that very little improvement in power factor could be obtained by the use of induction motors (only from 62.2 per cent to 62.6 per cent), and the alternative of using synchronous motors of conventional design to obtain improved power factor did not offer as satisfactory a solution as installing motors particularly adapted to the speed and torque requirements of the new machinery. In order to combine the advantages of heavy starting torque and stability characteristic of induction motors with the possibilities offered by synchronous motors for power-factor correction, it was found advisable to install motors of the Fynn-Weichsel type supplied by the Wagner Electric Corporation.

Analysis of the correction required to raise the demand power factor from 62 to 85 per cent with the additional demand of 163.5 kw. imposed by the four new machines showed, as previously indicated, a needed leading effect amounting to 102.6 reactive kva. Comparing this with the lagging effect of 198.8 reactive kva. anticipated with the use of induction motors for the additional drives, the total correction necessary would have to be at least 102.6 + 198.8, or 301.4 reactive kva.

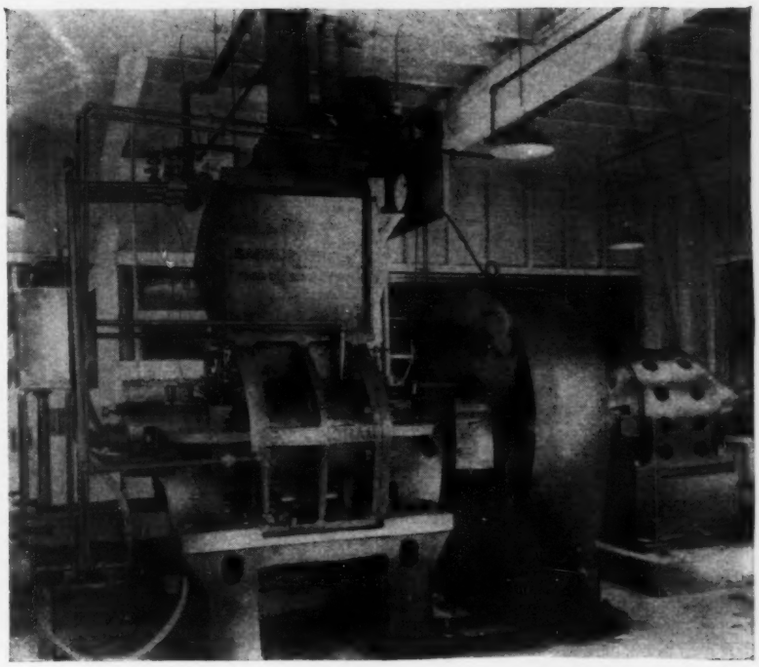
The actual correction obtained with the Fynn-Weichsel

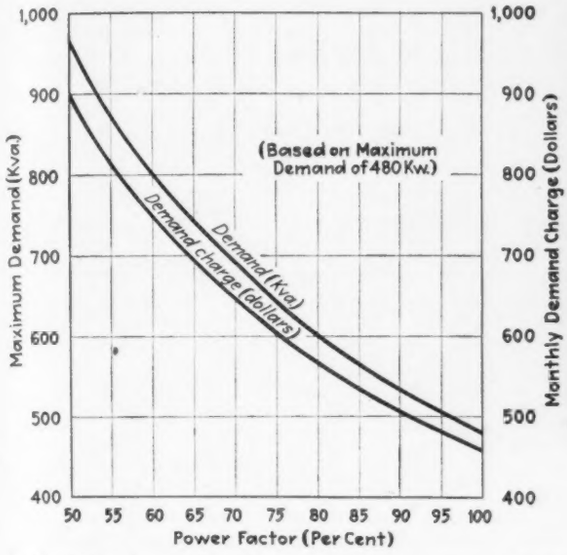
Cost of Power-Factor Correction

Rating, Hp.	Speed, R.P.M.	First Cost of Motors: Fynn-Weichsel	First Cost of Motors: Induction	Difference
50	600	$1,351	$1,040	$311
75	600	1,682	1,390	282
100	600	1,952	1,590	352
100	600	1,952	1,590	352
		$6,937	5,610	$1,297

100-hp. motor driving Banbury mixer

To facilitate removal of obstructions in the mixer a reversing switch is provided in the control circuit. The direct-current winding of the motor automatically acts as a dynamic brake in stopping the machine suddenly under load through an interlocking switch.





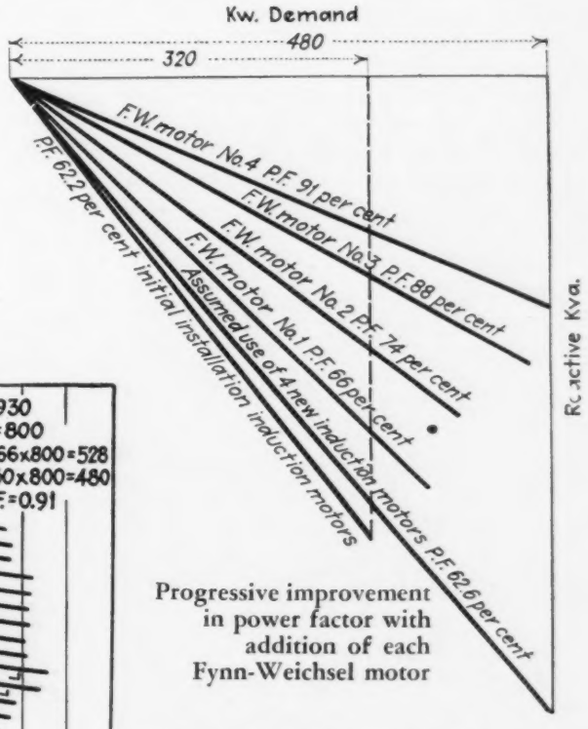
Reduction in demand charge with power factor increase

motors installed in successive stages over a period of 22 months reached a maximum of 91 per cent power factor. After the first motor was placed in service the demand power factor was increased from 62.2 to 66 per cent, the demand having been increased from 320 to 370 kw. The next step with motor No. 2 installed showed a power factor of 74 per cent with a demand of 392 kw., and the third motor raised the power factor to 88 per cent. With all four Fynn-Weichsel motors in service the gain in reactive kva. as compared with the computed performance of induction motors amounts to the actual leading effect of the synchronous type motors, or 184.1 kva., to which may properly be added the anticipated lag with induction machines, amounting to 198.8 reactive kva., or a total of 382.9 reactive kva.

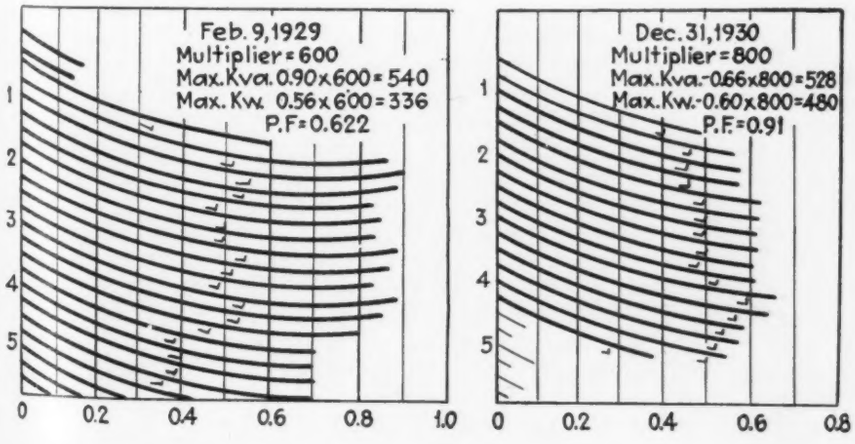
Records of demand kw. and kva. before and after the installation are shown in the meter charts reproduced and the results check closely with the calculated values.

The economy of using motors suitable to load requirements designed to correct the plant power factor is shown in the accompanying table,, which discloses a monthly saving in the power bill of more than 30 per cent due to reduction in the demand charge. The difference in first cost of the Fynn-Weichsel motors and of slip-ring induction motors is absorbed in less than six months.

The total reactive effect of utilizing the Fynn-Weichsel motors is 382.9 kva., making the first cost of correction


Kw. Demand
480
320
F.W. motor No.4 P.F. 91 per cent
F.W. motor No.3 P.F. 88 per cent
F.W. motor No.2 P.F. 74 per cent
F.W. motor No.1 P.F. 66 per cent
P.F. 62.2 per cent initial installation induction motors
Assumed use of 4 new induction motors P.F. 62.6 per cent
Reactive Kva.

Progressive improvement in power factor with addition of each Fynn-Weichsel motor



Demand charts before and after power-factor correction

per reactive kva., as compared with the use of induction motors, $3.38.

Using induction motors the additional load would result in a kva. demand corresponding to 483.5 kw., with a power factor of 62.6 per cent, or a kva. demand of 772.3 This corresponds to a monthly demand charge of $721.32. By the use of synchronous type motors (Fynn-Weichsels) the demand kva. is reduced to 528 and the demand charge to $501.45. The monthly saving on the demand charge is $219.87. The entire motor installation is paid for on this basis in 31 months' service.

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Logarithmic Plot Facilitates Copper Loss Studies

By ELMER F. ANDERSON
Electrical Engineer
Portland General Electric Company, Portland, Ore.

Calculating and plotting of I^2R loss curves necessary in the determinating of system losses, and for other engineering problems, becomes tedious and costly where a great number of power lines, transformers and other apparatus are involved. The conventional method of plotting an I^2R loss curve requires the calculating of the losses for four or more loads in order to obtain points sufficient for a reliable curve. Considerable time can be saved in plotting these curves by the following method, whereby fewer calculations are required and only a straight line graph is necessary.

A sheet of logarithmic scale cross-section paper with log scales for both ordinates and abscissas is used. Paper with a 5-in. base and two or more phases for each ordinate serves very well. Since the phases of log paper are in multiples of 10, this sheet can represent transformer sizes, for example, from 1 kva. to tens of thousands of kva., with their corresponding copper losses. A reference line, *A*, is a necessary part of this method and is determined by plotting points on the log paper corresponding with the following:

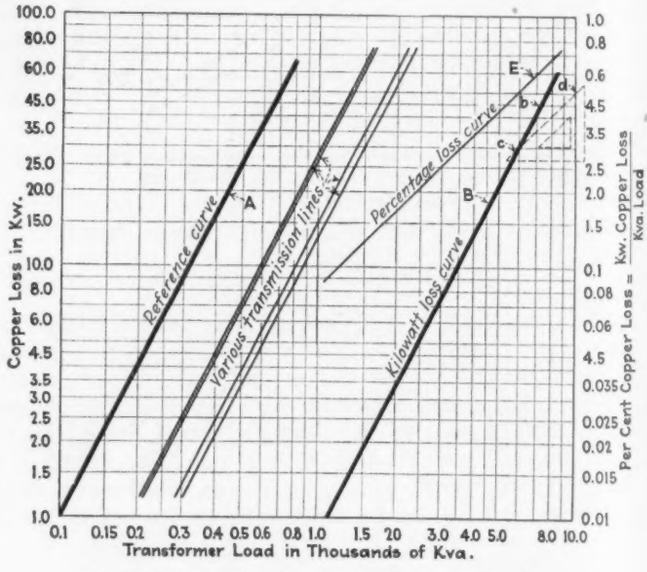
Abscissa	Ordinate
1	1
2	4
5	25

With the reference line drawn the abscissas and ordinates should be marked in values corresponding with the range of loads and losses to be considered. The sheet is now ready for determining line, transformer, motor or generator copper losses, as the case may be.

Take, for example, a 7,000-kva. transformer. The I^2R loss, or impedance watts, at a given load having been obtained either from tests or from the manufacturer's data, is found to be 46.87 kw. at full rated load. This point (*b*) is plotted on the log paper and a straight line (curve *B*) is drawn through it parallel with the reference line. Values of I^2R losses at any load may now be obtained from this curve. For example, at 3,000 kva. load the loss will be 7.5 kw. If the impedance watts value at full load is used the curve will contain the load losses of the transformer, which, of course, is desirable. This method makes possible plotting copper loss curves for a dozen or more power lines, or other apparatus, on one sheet without the curves crossing or being confused in any way. It should be noted that the curves represent copper losses only.

In the case of a transformer the core loss is constant throughout its rated range of load. This value of core loss must be added to the copper losses as found from the curve in order to obtain the total transformer loss. The same holds true for rotating apparatus where friction, windage and core losses are constant throughout the rated range of load. Where high-voltage transmission lines are to be considered the corona loss must be added to the copper loss in order to determine the total losses.

Another advantage offered by this curve is that the value of copper loss may readily be obtained in per cent of the corresponding load. In order to determine the percentage loss, place a 45-deg. triangle on the log paper with the base parallel to the abscissa and the 45-deg. edge passing through the point on the curve at which the per cent loss is desired. The per cent loss is then read



Straight line indicates varying copper loss

All loss curves for lines, transformers and machines are parallel to a straight reference line *A*. Curve *B* is for a 7,000-kva. transformer and passes through *b*, which shows a loss of 46.87 kw. for a load of 7,000 kva.

Per cent loss for *c*, a 30-kw. loss at 6,000-kva. load, is 0.05 per cent and is obtained by using a 45-deg. triangle. Curve *E*, at 45 deg. through 0.05 per cent loss at 6,000 kva., gives all losses in percentage to scale at right.

where the 45-deg. edge crosses one of the major ordinates (1, 10 or 100, etc.).

If it is desired to have a curve giving the per cent copper loss at any load, all that is necessary is to determine the copper loss in per cent of load kva. for one value; plot this point and draw a straight line through it at 45 deg. to the abscissa. The per cent loss may then be read from this curve at any desired load. Such a curve is shown at *E*, for the above-mentioned transformer.

The mathematical proof of these curves is simple. It is well known that the equation for copper loss is also the equation of a parabola. Plotting the log of this equation ($W = 2 \log I + \log R$) gives a straight line. It should be pointed out that with this method of computing losses it is not practicable to approach zero load and zero loss too closely, since the log of zero is minus infinity.

Overhead Secondary Network Next Move in Distribution

By W. R. BULLARD
Engineering Department
Electric Bond & Share Company, New York, N. Y.

Network for overhead has awaited light and relatively inexpensive network switch.

Such a switch is now available in both manual and automatic types.

IT IS well known that one of the chief advantages accompanying the use of underground low-voltage a.c. network systems, from the standpoint of economy, has been the use of the higher voltage primaries, permitting connection of distribution feeders directly to the generating station bus, and thus eliminating transformer substations. This same saving is applicable to overhead systems of radial and other types. In some cases its application has been somewhat slow due to several factors which are mentioned further on.

A compromise scheme making use of the lower voltage primaries, namely, that of primary networks, has recently been used in overhead systems in a few instances. This scheme, while not eliminating transformer substations, simplifies them by reducing their individual capacity, by building them as factory units and installing them in vaults similar to distribution transformer vaults except for size. Primary feeder lengths are reduced and there are also other economies claimed for primary networks. However, the chief feature is considered to be the improvement of reliability of service by the interconnection of primaries into a sectionalized network.

Desirability of primary networks questioned

Primary networks appear to be a rather unsatisfactory general solution to the question of economy, although economies may be sometimes shown in individual cases. Also they tend to perpetuate the use of intermediate voltages for primary circuits; that is, 4 kv. and 2,300 volts. During recent years such voltages have been found inadequate, in many situations, to serve properly the loads encountered. And with the present trend toward widespread use of major appliances and the steady increase of energy consumption per customer in residential districts it is inevitable that the present more usual primary voltages must give way generally to the higher voltages. For these reasons the writer questions the desirability of the adoption of primary networks (within the present popular meaning of the term) except under specially favorable local conditions.

Radial systems using higher voltage overhead primaries have been used in many locations with satisfaction and with gratifying economy, the latter being mainly due to the elimination of transformer substations, but also to other factors. However, in some situations certain objections are voiced to the use of the higher voltages for overhead cricuits. Among these are personal hazards, interference from shade trees, lack of generally accepted bases for joint use of poles with communication companies at the higher voltages, remnants in scattered localities of governmental regulations preventing the use of higher voltage primaries, difficulties of doing hot line work, and possible reduced reliability of service due to the fact that individual high-voltage feeders may cover larger territories and, therefore, individual outages may affect a greater number of customers.

The question of personal hazards has been debated at some length from time to time. To those thoroughly familiar with the subject it is not surprising that such discussions have indicated in general that, if anything, the higher voltages may be less hazardous. This is because construction practices for higher voltage feeders are, in general, more conservative; fewer circuits are required, thus providing less congestion; such circuits are treated with more respect by linemen and others, and trip-out due to faults is more certain.

The question of interference from shade trees is important in some situations, but in most cases with which the writer has come in contact this factor has been found to be relatively unimportant and, in general, can be handled by the use of aërial cables or some sort of tree wire and by judicious tree trimming.

In the past there have been no generally accepted bases for joint use of poles with communication companies involving power lines of the higher voltages. However, due to the growing use of the higher voltages and the realization that their use involves an important economic advantage, the joint subcommittee on development and research of the N.E.L.A. and Bell Telephone System now has this problem in hand. Certain trends of development in both communication and power system practices, as well as the co-operation evidenced in the manner in which the problem is being attacked, give promise of a satisfactory solution. As examples of the trends in development referred to may be mentioned, in the communication system, the use of sheathed cable installations in preference to open wire circuits, and in the power system the development of higher speed relaying and switching.

Governmental regulations are, as they have been in the past, still giving way to necessary advances in the art and to the realization that hazards may even be reduced by the use of the higher voltages.

Cheap network switch facilitates overhead network

The reliability of service and facility for doing work on primary circuits in underground low-voltage networks are now well established and much thought has been given to the application of the same principle to overhead

distribution. Such application has been awaiting mainly on the development of a low-priced network switch, the low-cost feature being imperative due to the light load densities prevailing in overhead districts and, therefore, the relatively high cost per kva. of load for scattered individual switches.

With the announcement that network switches suitable for overhead service are now available, a real impetus should be given to the use of the higher primary voltages with the attendant economies. One manufacturer now offers two general types of overhead network switches, one manually reclosing and the other automatic reclosing, both being fully automatic in the opening operation. The prices, while probably not at the ultimate minimum level, are reported to be sufficiently low to make these units available for wide application to overhead systems.

Reliability of service and economy derived

Whether the hand-operated or the automatically operated type should be used is largely a question of price balanced against the advantages to be secured by full automatic operation. Quite probably it will be found that in many situations the lower price will justify the use of the simpler type, the chief operating disadvantage being the necessity of sending men out to reclose the switches after the occurrence and removal of a primary short circuit. For well-built systems this may be found to be of minor importance.

At any rate, we thus have available means for securing a high degree of reliability of service in overhead distribution systems, whether the primaries be of the lower or of the higher voltage type. To what extent and to what situations is this apparatus applicable? Of course, its application will not be limited to systems having the higher voltage primaries. Assuming that, in any case, the use of higher voltage primaries with the attendant economies is inevitable, the writer's studies have indicated that the use of this apparatus will be determined largely by requirements for reliability of service. Nevertheless, there are certain inherent equipment economies which are provided by the application of the automatic network principle to overhead distribution which should not be overlooked. For instance, lightning arresters and fused cutouts may be eliminated from primary circuits, simple gaps being substituted for the arresters.

As stated before, the radial type of system involving higher voltage primaries has been quite successful in some instances, and one point which should be particularly noted is that it is very easy to operate radial and network installations in combination. While it will probably be desirable to network completely some overhead districts, we may keep in mind, however, as another important application of the network switches the districts where, for the greater part, radial feeders will suffice. Scattered through such territories will be found loads which require a high degree of reliability of service. For these loads network switches can be applied and energy supply obtained from two or more of the radial feeders. The writer believes that such a judicious combination of radial and network practice will not only be highly economical, but can be made fully as satisfactory from the standpoint of reliability of service as any particular situation may require. The economy over present general practice will be quite marked in situations where substations can be eliminated by higher voltages.

While considerable work lies ahead in developing details of design features for this new type of overhead system, the finding of satisfactory solutions for any problems which may arise will be easily accomplished. With the experience gained in the development and operation of numerous underground network systems as a background, the design of the first overhead systems will be largely a matter of adaptation of practices already established.

High impedance of distribution transformers will be found desirable from several standpoints, but not necessary.

Various degrees of interlacing of primary circuits to accomplish different results may be used. In combined radial and network systems opportunity will be given for display of ingenuity in avoiding unnecessary duplication of lines, but simple solutions for given local conditions will usually be found.

Low-voltage short circuits will behave very much the same as in underground systems, with the exception that the relative disturbance will be very much less, due to lower load capacity (higher impedance and smaller copper cross-section) of lines and transformers. This fact should allay any fears as to hazards to the public due to exposed positions of lines.

Where the use of feeder regulators or different supply buses is involved no new problems will be presented.

In short, a new field of possibilities for improvement in economy and service reliability in overhead distribution systems has been opened up and, through knowledge gained by experience, the way has been made easy for those who would take advantage of the opportunities.

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Finding the Country Customer

By M. E. SICKLESTEEL, JR.

Drafting and Surveying Bureau, Detroit Edison Company

Quite often a call comes in for a fuse renewal from a customer who is renting a summer cottage for two weeks. This person is not well enough acquainted with the community to know the name of the nearest cross road, which would give the trouble man a clue. The customer knows that he is "about a mile north of Port Huron right on Lake Huron and the cottage is green trimmed with white" and that his lights are out. The trouble man is anxious to replace the blown fuse, but in this vicinity cottages are numerous and green is quite a popular color. Quite often, too, the customer's conception of one mile is hazy. Numerous situations like these have prompted the Detroit Edison Company to stand the expense of installing a house-numbering system where none has previously existed.

After a thorough consideration of the problem, it was decided to accept present city or village numbering systems where established and to extend their scope out into the country, in some cases as far as 15 miles. When the job was finally laid out complete in the office we had assigned house numbers originating in some well-known village or city for our entire territory. Authority of the towns was always obtained in writing in advance to eliminate any unpleasantness.

The new house number was written on the meter reading card at the time of the next reading and from this card has been transferred to all customer records.

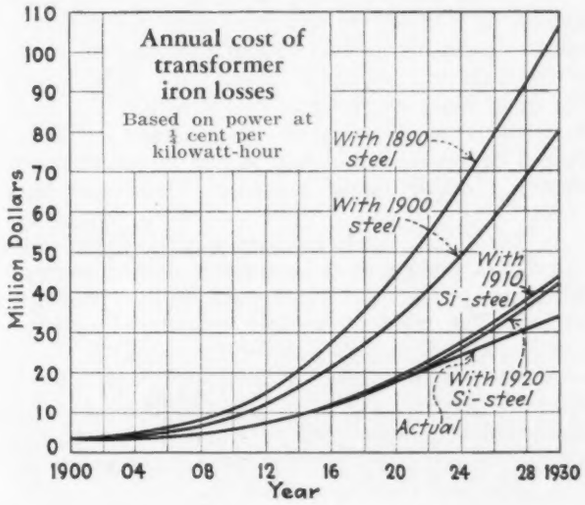
READERS' FORUM

Why Silicon Improves Electric Sheet

To the Editor of the ELECTRICAL WORLD:

There are two points in connection with your fine editorial on silicon steel (or silicon iron as I prefer to call it) in the February 27 issue of ELECTRICAL WORLD on which I would like to comment:

1. If there is any effect of silicon on the hysteresis loss of iron, it is such as to cause an increase. However, for practical purposes, it may be regarded as negligible. The benefit of silicon, aside from increasing the



electrical resistance of iron and thereby decreasing the eddy loss, is due to the effect of silicon on the impurities in the iron, chiefly oxygen. If there were no impurities present in the iron silicon would not improve its magnetic properties. It is because iron, as ordinarily made, contains all sorts of impurities, among them oxygen (both in solution and as oxides), that the addition of silicon helps. The reason for the large improvement in the magnetic properties of silicon iron since Hadfield's first sheets in 1903, and particularly during the past ten years, is due to the fact that we have learned some of the secrets and have started to apply them in our steel mills. There is no longer any mystery about the causes of the variations. They are all contained in the one word "impurities." The difficulty lies in removing them under practical conditions. It may make very little difference to the electrical engineer just what the beneficial effect of silicon is due to, but as long as we know something about it, I thought it might be well to pass it along. I think your figures on savings due to silicon certainly cover the range. My estimate for 1930 was $47,000,000 with power cost estimated at 0.25 cent per kilowatt-hour. I attach a chart prepared in 1930 that gives a picture of the development and its value to the industry.

2. The effect of silicon on the elastic properties of iron is another point on which there exists misunderstanding, and differences of opinion. The fact that ductile 4 per cent silicon iron has been made shows that this alloy is not inherently brittle, and we know definitely that silicon increases the tensile strength of iron. We are at the same stage in the development in regard to the brittleness problem as we were fifteen years ago in regard to the magnetic properties, except that we know much more now in regard to the science of metals than we did in 1915. Consequently, it should not take very long now to ascertain the real causes of the brittleness of silicon iron and to find an effective remedy that will yield a ductile alloy consistently. The more urgent the demand, the sooner the goal will be reached.

T. D. YENSEN,
Manager Magnetic Division.
Westinghouse Electric & Manufacturing Company,
East Pittsburgh.

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BOOK REVIEWS

Artificial Light and Its Application in the Home

By the Committee on Residence Lighting, Illuminating Engineering Society. McGraw-Hill Book Company, 330 West 42d Street, New York. 142 pages. Illustrated. Price $1.50.

This interestingly comprehensive and understandable book deals with a subject which heretofore has been treated in form interesting to technical groups only. It might be called a "Translation," which turns a wealth of technical information into a language readily understandable to the layman. Withal, the correctness and accuracy of the subject have been well preserved. Not considering light as a thing apart, the authors have shown its detailed application to the home and have used drawings and photographs generously to take it from the theoretical to the actual.

Written by experienced specialists, sponsored by a non-commercial group, it should gain ready acceptance as authoritative information about the increasingly attention-demanding subject of home lighting.

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Siemens Handbooks

Allgemeine Grundlagen der Elektrotechnic (1). By Dr. C. Michalke. 167 pages. Price, 5 reichsmarks.

Das Kraftwerk Fortuna 11 (5). By Albert Schreiber. 175 pages. Price, 6.50 reichsmarks.

Des Leistungsfaktor (7). By Dipl.-Ing. G. Scharowsky. 197 pages. Price, 7.50 reichsmarks.

Elektrisches Schaltzeug (8). By Ernst Schupp. 192 pages. Price, 5.40 reichsmarks.

Elektrizität im Bergbau (13). By various authors. 390 pages. Price, 11.50 reichsmarks.

Elektrische Bahnen (15). By O. Horing. 515 pages. Price, 15 reichsmarks.

Published by Walter de Gruyter & Company, Berlin W10 and Leipzig.

These six volumes (Fundamentals of Electricity, "Fortuna II" Power Plant, Power Factor, Switching Equipment, Electricity in Mining, Electric Railways), published at intervals during the past few years, belong to the Siemens Handbook series, the volume numbers being indicated in parentheses after the titles. All are copiously and excellently illustrated with line cuts and halftones, and in several instances with plate inserts. The subject matter covers a wide range, as is evident

from the titles; the treatment is simple and is intended to inform the younger electrical worker and the general reader as well as the expert.

While primarily descriptive, these books set forth the analytical approach to engineering problems and contain much factual material, in tables and charts, as well as some interesting historical illustrations.

The series, throughout, records modern usage; the illustrations are in general drawn, as might reasonably be expected, from the practice of the manufacturing company whose name it bears. The authors are engineers prominently identified with technical developments in their several fields.

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Cours d' Électricité Théorique, Tome III

By J.-B. Pomey. Gauthier-Villars et Cie., 55 Quai des Grands-Augustins, Paris (6e). 318 pages, with diagrams. Price, 90 francs.

Three volumes, of which the present is the third, constitute the course in the theory of electricity at the Advanced Professional School of the Postal and Telegraphic Service; the present author is the chief engineer of that service. The treatment is mathematical; for instance, the theory of vector functions, having been explained in Vol. I, is now taken for granted and further mathematical concepts, including relativity, are introduced. The subject matter of Vol. III is radio transmission and cable telephony. The book will appeal to the adequately prepared student who desires a comprehensive analysis in the light of modern electrical theory.

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Regulation of Public Utilities

By Cassius M. Clay. Henry Holt & Company, New York. 309 pages. Price, $3.50.

The chief troubles with regulation are sensed here as a consequence of the unscientific groove into which the subject has been forced by judicial temporizing with a social-economic question in an unsynchronized constitutional atmosphere. It is not strange therefore that rate regulation presents the most intricate and perplexing matter which comes before the courts. Maybe the Supreme Court made a tactical error when it invented the rate base concepts in an effort to resolve the broad area between "What is an economically proper rate?" and "What is a constitutionally proper rate?" Maybe the construction placed upon the due process clause of the Fourteenth Amendment should have discriminated sharply between confiscation of physical property and mere degrees of restraint placed upon its enjoyment when devoted to the public service.

This is the dominant theme of this member of the bar in a well-written and far from tediously legal analysis of a "crucial constitutional problem." In no sense dogmatic in surveying the evolution of the utility system, its regulation and the squaring of it with the constitutional precepts, the chapters are profuse with references to ruling economic as well as judicial thought, all introduced so unobtrusively that the development of the topic is notably smooth. Incidentally the author is no devotee of governmental ownership or even of federal regulation unless the judicial excursion into controversial economics has so closed the door to full restoration of police power to the states as to have made our constitution permanently a partisan of a particularized code of ethical and economic opinion. Mr. Clay joins "Holmes and Brandeis dissenting."

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The Holding Company

By James C. Bonbright and Gardiner C. Means. McGraw-Hill Book Company, New York. 389 pages. Price, $4.

Professor Bonbright is established as a critic of current regulation. Here he analyzes holding company motivation, technique, accomplishment, restraint. The tone is not always caustic and castigatory even though he asserts early that the holding company has become the greatest of the modern devices by which business enterprises may escape the various forms of social control. It is viewed here as the able successor of the abandoned stock-watering device.

Here and there a pause is made to lay a wreath of homage on a lily-white structure or two, but that merely interrupts the measured tread of the funereal procession of the fattened skeletons which still stalk among us. The great mass of disfranchised investors line the route in a mien of bewildered bereavement. That these bloated cadavers should not be put in confinement constitutes a major public menace. There you have the tone.

As for detail, much familiar statistical and historical material is presented in connection with a portrayal of the more prominent and typical utility holding companies. The railroad holding company is given equal prominence. Of course, stiffer regulation is the recommendation, with major reliance on the Couzens bill. Being so utterly social in aim the treatment fails to acknowledge enough good in capitalism itself to grant any measure of beneficence in what it devises to circumvent blind and repressive restraint.

A sizable appendix analyzes many cases wherein minority interests have sued to protect their rights in merger and financial manipulation moves.

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Recent N.E.L.A. Committee Reports

Electric Water Heating—Serial report No. 166, N.E.L.A. water heating committee. Price to members, $1.25; to non-members, $1.75.

This 84-page report contains 80 curves and more than twenty tables dealing primarily with the electrical load characteristics of various type water heaters, their diversity and after-diversity demand curves. Additional sections deal with off-peak or controlled water heating service.

Cable Research—Serial report No. 160, N.E.L.A. underground systems committee. Price to members, 15 cents; to non-members, 25 cents.

Summarizes projects conducted under direction of cable research sub-committee.

Acceptance Inspection and Testing of Cable—Serial report No. 162, N.E.L.A. underground systems committee. Price to members, 20 cents; to non-members, 30 cents.

The usual statistics on acceptance inspection and testing of cable purchased by member companies are contributed by the Electrical Testing Laboratories and United Engineers & Constructors, Inc.

Power Station Betterment.—N.E.L.A. Prime Movers Report No. 211. Price to members 20 cents; price to non-members 30 cents.

Diesel Engine Power Costs—N.E.L.A. publication No. 29, March, 1932. Price to members 25 cents, to non-members 40 cents.

Men of the Industry

HENRY B. SHAW announces his resignation as chairman of the Public Service Commission of Vermont. He will resume the practice of the law at Burlington, in that state.

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W. S. WATSON, who for sixteen years was city water and light commissioner for Hastings, Neb., has been appointed superintendent of the Board of Public Works at Hannibal, Mo. He has charge of the municipal water works and light and power facilities in Hannibal.

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L. W. BARNES, who has been commercial manager of the Wisconsin Power & Light Company at Beloit, Wis., for several years, has been appointed assistant district manager. J. H. MURTAUGH, formerly connected with the company at Sheboygan, has taken Mr. Barnes' place as commercial manager.

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EUGENE ENLOE, a pioneer in electric light and power development in the Big Bend country of Washington, including the formation of the Big Bend Light & Power Company and the Okanogan Valley Power Company, both of which later were acquired by the Washington Water Power Company, has been made president of the Washington Trust Company, Spokane, succeeding the late M. B. Connelly. Mr. Enloe has been a director of the bank for four years.

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HOWARD E. BLOOD, president of the Norge Corporation and the Detroit Gear & Machine Company, was elected first vice-president of the Borg-Warner Corporation at a recent meeting of directors. Mr. Blood had had extensive experience in the automotive field before he started in 1925 the engineering development of electric refrigeration which two years later became the Norge Corporation. It was in 1929 that the Norge Corporation merged with the Detroit Gear & Machine Company and Borg-Warner Corporation of Chicago. Since that merger Mr. Blood has been a director of Borg-Warner Corporation and a member of its executive committee.

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KERN DODGE, consulting engineer of Philadelphia, was recently appointed Director of Public Safety of the city of Philadelphia. Mr. Dodge is a native of Chicago and was graduated from Drexel Institute in 1907. For four years, before and after school each day, he took charge of the electric plant at the works of the Link-Belt Company, where finally, in complete charge of new electrical equipment, he changed over the entire system to electric drive. He was placed in charge of the electrical equipment at the Harrison Safety Boiler Works of Philadelphia, where he later entered into a partnership with Charles Day in consulting engineering. This company subsequently became Dodge, Day & Zimmermann, and Mr. Dodge's work was chiefly in connection with public utility properties. He is a director of the Line-Belt Company, a member of the New York Electrical Society, the American Society of Mechanical Engineers and the Illuminating Engineering Society.

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C. R. BEARDSLEY has been appointed assistant to the superintendent of distribution of the Brooklyn Edison Company. Following graduation in 1905 from Yale University, Mr. Beardsley spent six years with the General Electric Company in the testing department and New York and New Haven offices. Six years of sales and industrial plant electrification in Bridgeport, Conn., were followed by power-plant electrical work from 1918 to 1923 with Fred T. Ley & Company. Since 1923 Mr. Beardsley has been electrical construction engineer of the Brooklyn Edison Company, having had supervision of the electrical construction of the Hudson Avenue power station and of substations. Mr. Beardsley is a fellow of the A.I.E.E. and from 1928 to 1930 was chairman of the accident prevention committee of the N.E.L.A.

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DAVID K. E. BRUCE of New York was elected a director of the Westinghouse Electric & Manufacturing Company at the recent annual meeting of the stockholders. A lawyer by profession, Mr. Bruce was in the diplomatic service and was associated with the Bankers' Trust Company and the W. A. Harriman Company of New York. Mr. Bruce is also a director of the Consolidated Gas, Electric Light & Power Company of Baltimore, the Aluminum Company of America, the Worthington Pump & Machinery Corporation and many other industrial enterprises.

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OBITUARY

LIONEL G. NIGHTINGALE, manager of the cost and rate section of the Central Hudson Gas & Electric Corporation in charge of industrial development for that company, died of pneumonia at his home in Staatsburg, N. Y., on April 11. He was born in Brooklyn in 1881 and had been connected with the Central Hudson company since 1916. Previously he was associated with the Telluride Power Company in building long-distance transmission lines in Utah, Colorado and Idaho. He was a graduate mechanical engineer.

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C. J. YORATH, who had been prominently identified with the public utility industry in Canada for a number of years, died in Calgary, Alberta, April 2 of a heart attack. Born in Cardiff, Wales, 52 years ago, Mr. Yorath removed to Canada in 1913 at the request of the Canadian Agencies, Limited, and established himself in Saskatoon, Saskatchewan. He was appointed commissioner of that city and remained there until 1921. In that year he entered the service of the city of Edmonton as Commissioner of Public Works and Finance, where he made a reputation for himself as an economist in municipal affairs and in the administration of public utilities. In 1924 Mr. Yorath became president and general manager of the Northwestern Utilities, Limited, and a year later the Canadian Western Natural Gas, Light, Heat & Power Company came under his management. About this time his business associates became interested in electrical properties and under his direction acquired an extensive system of holdings in Saskatchewan, Alberta and British Columbia. In addition to the presidency of the Canadian Western Natural Gas, Light, Heat & Power Company and the Northwestern Utilities, Ltd., Mr. Yorath was president and managing director of the Drumheller Consolidated Collieries, president and managing director of the Union Power Company, president of both Duncan Utilities and Mid-West Utilities and a director of the London & Western Trust Company.

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ALLISON J. VAN BRUNT, director of safety education with the Public Service Corporation of New Jersey since 1913, died suddenly in his office in the Newark Terminal Building April 5. Mr. Van Brunt had been suffering from a heart ailment about a year. He was nationally known for his work in the interest of "safety first" and was one of the organizers of the National Safety Council. He was an earnest promoter of the Schafer prone-pressure method of resuscitation and a member of the accident prevention committees of the National Electric Light Association and the American Gas Association. He was born in Brooklyn in 1862 and had been with the Public Service organization since 1908.

Charles L. Edgar of Boston Edison Dies at Age of 71

As briefly reported in last week's issue of the ELECTRICAL WORLD, Charles L. Edgar, president and general manager of the Edison Electric Illuminating Company of Boston, whose sterling character, executive ability, professional experience and intellectual capacity maintained him in the front rank of pioneers and leaders of the electrical industry for

nearly a half century, died in Atlantic City on April 14 after a few days' illness from pneumonia.

Mr. Edgar was born in 1860 at Griggstown, N. J., near the site of Mr. Edison's famous Menlo Park laboratory. Following his graduation with honors in electrical engineering from Rutgers College in 1882, he soon obtained a position with Mr. Edison and was associated with the early construction work of the Edison Electric Light Company of New York City. In the fall of 1887 he went to Boston as station manager of the Edison company of that city, was elected general manager in 1889 and vice-president in 1894. In 1900 he was made president and he retained the title of general manager of the company until his death. The development of the Edison Electric Illuminating Company in the past 45 years represents corresponding chapters in Mr. Edgar's biography written in terms of plant and system expansion, commercial development, the acquisition of suburban properties, increase in number of employees, construction of new generating stations, lines and substations, financing, interconnection, trade relations improvement and many other aspects of the evolution of what was once a small downtown property into the present far-flung metropolitan system.

As early as 1890 Mr. Edgar visited Europe and spent several weeks studying the principal electric light stations in England and on the Continent, where he gathered many ideas incorporated in the Atlantic Avenue generating plant in Boston. Three years later he again went abroad to investigate the use of storage batteries as central-station auxiliaries and on his return pioneered in this phase of electrical work. In 1902 the Suburban Light & Power Company and the Boston Electric Light Company became a part of the Edison system, and in 1904 the company began to expand into outlying territory. The L Street station was built, embodying the commercial application of large vertical steam turbines as prime movers, and after years of further expansion the Edgar station at Weymouth followed with its pioneer application of 1,200-lb. steam pressure in production.

More recently the development of steam-heating service has taken place in downtown Boston under the company's auspices, and for some years Mr. Edgar had devoted much personal consideration to problems of trade cooperation. It is a fair statement that his enlightened and friendly policies were in no small measure responsible for the utter failure of anti-merchandising legislation to make the slightest headway in Massachusetts during the past winter. In the field of employee welfare Mr. Edgar had long rendered conspicuous service. Before the World War he pioneered in the construction of general-service buildings and a collateral welfare group, and he exerted notable leadership in measures for maintaining stability of employment and the protection of long-service employees by annuities and contracts against the vicissitudes of a changing era.

During the war Mr. Edgar was appointed a member of the Naval Consulting Board. He was chairman of the board of directors for the Massachusetts organization for industrial preparedness, served on the national committee on gas and electric service and was also connected with the fuel administration.

In 1928 Mr. Edgar was elected chairman of the board of directors of the New England Power Association, succeeding F. L. Carlisle. His knowledge of the electrical industry and of developments in the Northeast rendered his counsel of special value in the recent formative period of that organization, and the close operating relationship prevailing between the two systems reflects his electrical statesmanship.

Mr. Edgar's affiliations outside the Boston company embraced a wide range of interests and a remarkable sphere of service. He was a past-president of the National Electric Light Association and the Association of Edison Illuminating Companies, former acting president of the Society for Electrical Development, member of the executive committee of the Employers' Liability Insurance Corporation of London, England, and a trustee of Rutgers College and of the Massachusetts Utilities Associates; a vice-president of the American Institute of Electrical Engineers, a director of the Electrical Testing Laboratories of New York, member of the American Academy of Political and Social Science, Illuminating Engineering Society, Institution of Electrical Engineers, American Society of Mechanical Engineers and many other organizations. In 1927 he was chairman of the industrial welfare department of the National Civic Federation. Mr. Edgar was the recipient of the degrees of electrical engineer and doctor of science from Rutgers and of LL.D. from Tufts College. He is survived by his widow and by his only son, Leavitt L. Edgar, vice-president of the Boston Edison company.

James H. McGraw Voices

"TWO outstanding executives were lost to the electrical industry with the passing of Charles L. Edgar in Boston and John B. Miller in Los Angeles, on the same day," said James H. McGraw, chairman of the board of the McGraw-Hill Publishing Company, speaking at San Francisco on Monday. "Their leadership will be missed and their loss mourned by the industry in the building of which each spent a lifetime."

"Charles L. Edgar," Mr. McGraw went on, "held a place in the electrical industry singularly his own. A pioneer whose name is linked with Edison's, an elder statesman of far-reaching influence in the world of electricity, he yet continued in intimate association with the current problems and progress of the service of a city. Years, achievements, honors, eminence did not remove him from sympathetic contact with that public whom he so long served nor lessen his understanding. His mind went forward with the changing times, and in the more recent social, trade and economic problems of the public utility he was still the pioneer, building his great power system deep into the lives and the confidence of the people. The industry is greater, the world is richer, through the contributions of his life and work. The great station that bears his name will stand a monument to the sturdy char-

John Barnes Miller of California, Edison Chairman, Passes On

John B. Miller, chairman of the board of directors of the Southern California Edison Company, died April 14 in the Good Samaritan Hospital, Los Angeles, of blood poisoning. He had been the victim of an attack of influenza in January last. Mr. Miller, who was 62 years of age, had been the executive head of the company and its predecessors for the past 31 years.

He was one of the country's outstanding utility executives and a national leader among pioneers in financing large electrical engineering developments in the West. Through his organizing genius and convincing faith in the future of southern California he effected the amalgamation of about 40 small electric light and power companies serving cities in that territory, and, after first overcoming the difficulties of interesting Eastern capital in a Pacific Coast enterprise, he directed the expenditure of hundreds of millions of dollars for the construction of great hydro-electric plants, steam generating works and the building of extensive transmission and distribution systems.

Under Mr. Miller's direction the Edison company completed the ten-year Big Creek-San Joaquin River hydro-electric construction project in the Sierra Nevada Mountains, which involved the building of the famous Florence Lake tunnel; constructed the world's first 220-kv. transmission line to bring hydro-electric power from the Sierra to the Los Angeles area, and developed the Edison's Long Beach steam-electric generating station, one of the largest and most efficient plants in the country. The services of these electric facilities as one unit were extended by Mr. Miller and his organization to 360 cities and towns in California, following the consolidation in 1917 of the Pacific Light & Power Company with the Southern California Edison Company.

In 1923, at the convention of the National Electric Light Association in Carnegie Hall, New York, Mr. Miller received on behalf of his company one of the highest honors within the gift of the industry. This was the gold medal of the Charles A. Coffin Foundation, awarded the Southern California Edison in recognition of its distinguished contribution to the development of light and power during 1922. He himself founded the John B. Miller medal for distinguished service, which was first awarded in 1928, to Russell H. Ballard, president of the Edison company, for his contributions to the progress of the organization.

The customer-ownership plan of the California Edison company, which was inaugurated in 1917 and has since been adopted by many other organizations, was conceived by Mr. Miller and carried out with extraordinary success. The total number of stockholders has grown since the plan was formulated from 1,800 to 127,000, 90 per cent being customers. Employee ownership of company stock likewise was fostered by Mr. Miller, with the result that now 90 per cent of the Edison employees are stockholders.

Mr. Miller was born in Port Huron, Mich., in 1869 and attended the University of Michigan, where he studied until 1890, when he returned to his native city to enter a law office. Experiences in Port Huron influenced Mr. Miller to seek a business career rather than the law, and in 1892 he engaged in the ownership of a cotton plantation in Louisiana. From this first independent business venture he returned to Port Huron in 1894 and engaged in the steamboat and domestic fueling business.

In 1896 Mr. Miller, then 27 years of age, went to California for the first time and was so favorably impressed with the opportunities there offered young men that he closed out his interests in the East and returned to California to make his home. In his first connection with the then struggling electrical industry of the state he was associated with

William R. Staats and Walter S. Wright of Pasadena and George H. Barker. Soon afterward he joined Henry Fisher, H. H. Sinclair and John S. Cravens of Redlands. In 1898 he became associated with the Edison Electric Company in the capacity of treasurer, and in 1901 he was elected president, which position he retained with the successor company, the Southern California Edison Company. For almost a decade he carried the responsibilities of both chairman of the board and president, but in 1928 he relinquished the presidency.

Besides being chairman of the Southern California Edison Company, Mr. Miller was chairman of the board and a director of Claude Neon Electrical Products Corporation, president and director of the Landowners' Company, president of the San Joaquin & Eastern Railway, director and member of the executive committee of the Security-First National Bank of Los Angeles and Pacific Mutual Life Insurance Company, and a director of Claude Neon Lights, Inc., New York; Claude Neon Federal Company, Chicago; Shaver Lake Lumber Company, Highway Communities Corporation and John B. Miller, Jr., Company, Ltd.

Mr. Miller was elected a vice-president of the N.E.L.A. in 1925, and had he not refused the office would have become president in 1929.

Sense of the Industry's Loss

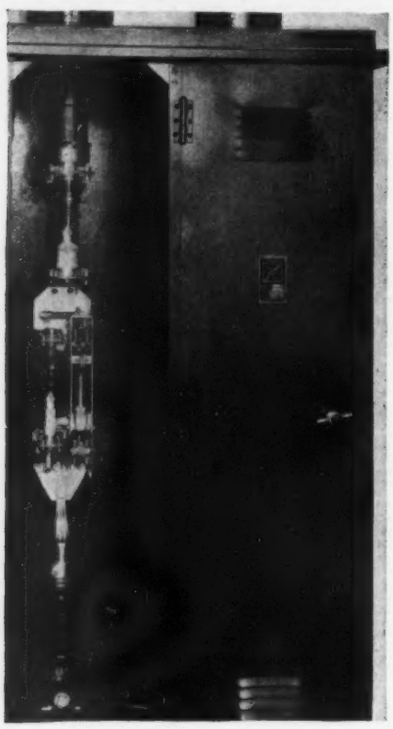
acter of this man, an enduring testimonial to the power of intelligent and unfaltering friendship.

"John B. Miller epitomized the spirit of the West. His was the vision of the pioneer. His appreciation of the natural resources and faith in the future development of the Pacific Coast were coupled with the knowledge that capital must be provided from Eastern financial centers if the electrical and industrial progress which he envisioned was to be realized. To the achievement of this task of empire building he set his hand. His keen financial judgment together with his rare organizing genius were directed toward the amalgamation of the many small utilities serving southern California. Forty properties were consolidated under his guiding hand into one of the largest electric light and power companies in the world, the Southern California Edison Company. In serving for 31 years as executive head of this utility he directed the efforts of his fellow workers in close adherence to the slogan which he himself set for the company in 1905, 'good service, square dealing and courteous treatment.' John B. Miller leaves behind him as a monument the far-flung system of hydro-electric and steam plants, with 220,000-volt transmission lines, built by the company to which he devoted his life's work."

New Equipment Available

Cabinet Mounting Used for Fuse-Switch Unit

A combination fuse and disconnecting switch with quick-break blade and fuse mounting installed in a cabinet, designated type TCS-MYB, is announced by Schweitzer & Conrad, Inc., Chicago.



With the combination switch and power fuse equipment it is possible to break load by means of the auxiliary fuse parallel with the disconnecting switch blade. When the disconnect switch, which has a quick-break attachment, is opened the line current is shunted through a low-ampere-rating fuse which parallels the disconnect blade, the fuse is blown and the line disconnected without drawing any arc on the disconnect.

A safety feature is provided so that when the low-current fuse which parallels the blade is not inserted in the fuse clips the disconnect blade cannot be opened. The low-current fuse must be inserted in the fuse clips before the disconnect can be opened.

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Non-Metallic System of Underfloor Ducts

A system of underfloor duct raceways and outlets consisting largely of masonry materials having a magnesite base is announced by the National Kellastone Company, Chrysler Building, New York. This material is fireproof and waterproof and has substantially the same coefficient of expansion as concrete, so that cracking is avoided at floor surfaces.

Other advantages include increased flexibility for service to local areas, separate underfloor unit system at right angles to exterior walls, self-contained feature for service to each bay, freedom from junction boxes and consequent avoidance of marring carpets and linoleum. Kellastone underfloor ducts are so devised that the greatest length of any run is not greater than the column centers from exterior walls to interior columns, permitting accurate screeding of a thin Kellastone pad.

The complete system includes base blocks which are set as the first course of the exterior walls, exterior and interior columns and intermediate partitions. The base blocks are so cast that two raceways are provided in the face of the wall or partition. The underfloor duct system and base blocks are connected by cast Kellastone fittings.

Kellastone material may be bored and cut with the same tools that are used for wood making, but is hard enough to stand wear and tear well.

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Supersensitive Relay Has Vacuum-Break Contacts

A new supersensitive relay operating with but 4 milliamperes at 6 volts, impervious to dust and dirt and safe where an open spark would be hazardous, is announced by the American Instrument Company, Washington, D. C. In spite of its extreme sensitivity, this relay is ruggedly built and may be mounted in any position. Contact is made and broken in a vacuum tube. It is long-lived and competitively priced.

The relay will control relatively heavy currents through the limited mechanical impulse of thermostat action or through variations in electrical resistance set up by varying the intensity of light striking a photo-electric cell. The equipment is made in two styles, in both of which coils, armatures and frames are identical. The relay coil has a resistance of 1,300 ohms and operates on 4 milliamperes at 6 volts direct current. Relays can be provided for special purposes with coil resistance up to 50,000 ohms. Relay No. 1, with open platinum-iridium or silver contacts, will break 50 watts; relay No. 2 will break a maximum of 1,320 watts. Contact is made and broken in an exhausted and sealed transparent glass tube. The contacts are normally closed and are caused to open by a slight pressure on the glass stem. The motion of the stem is a matter of a few thousandths of an inch and the break is quick and clean, even at high speeds. The contact is positive and is made in a vacuum between flat copper plates of ample cross-section. The glass stem is sealed into the relatively flexible glass bellows.

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Non-Resilient Brush Betters Commutation

An electrographitic brush known as National Pyramid grade No. 234, the characteristic of which is a non-resilient structure, a property which enables the brush to maintain exceptionally firm contact on commutators of high peripheral speed, is announced by the National Carbon Company, Inc., Cleveland, Ohio. It is stated that excellent commutation, low friction and high carrying capacity combine with the smooth-riding properties of this new grade to minimize brush wear and commutator maintenance. Its field of application is for heavy-duty, direct-current generating and substation equipment.

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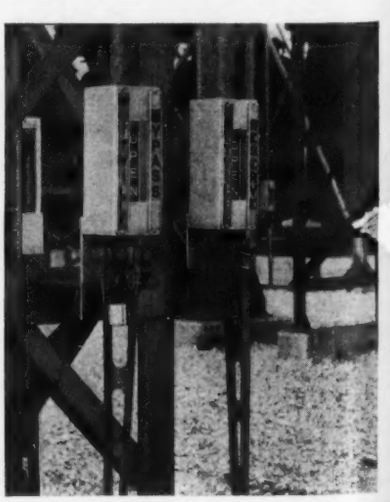
Weatherproof Designators for Lines and Positions

Weather-, water- and oil-proof designator signs for switch mechanisms, to identify poles and transmission towers, cells, oil switches and transformers, give operating instructions, etc., has been announced by the Delta-Star Electric Company, Chicago. The pressed zinc frames hold movable bake-



lite letters which can be changed to meet local conditions. A typical installation, illustrated, shows air-break switch operating mechanisms equipped with these new designators.